NASA SP-7011 (91)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 91)

JULY 1971

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7011 (91)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 91)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Scientific and Technical Information System during June, 1971.

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 316 reports, articles, and other documents announced during June 1971 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, irregular supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations and abstracts are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes—subject and personal author—are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1971 Supplements.

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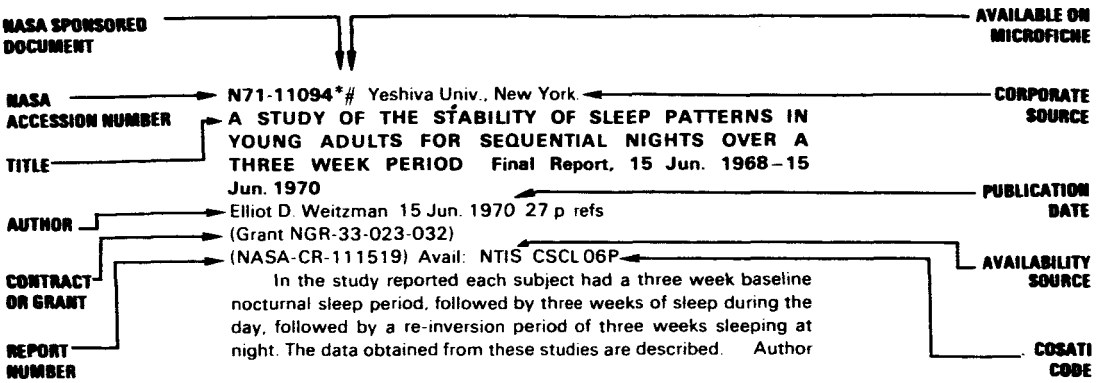

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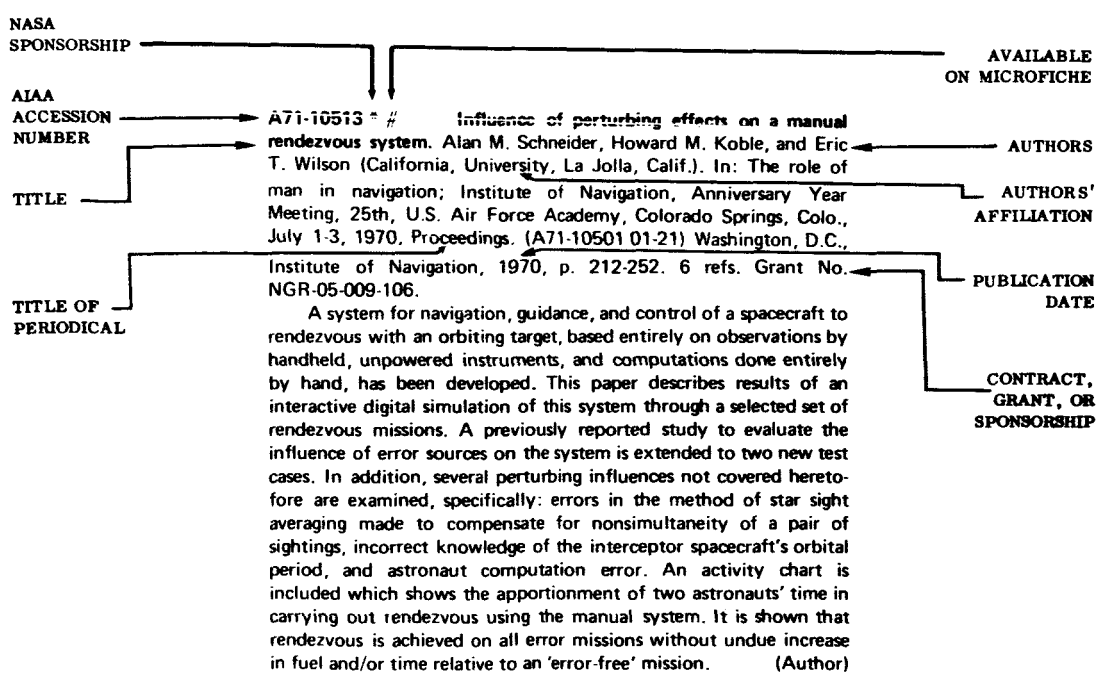

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography Suppl. 91 JULY 1971

IAA ENTRIES

A71-25142 A model of predictive control in visual target tracking. Noboru Sugie (Ministry of International Trade and Industry, Tokyo, Japan). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-1, Jan. 1971, p. 2-7. 10 refs.

Model to predict the behavior of the saccadic eye movement system. Forming an estimate of target motion and carrying out the optimal control based on the estimation are the main features of the model. The estimate, particularly that of the period of the square waves, is assumed to be performed with some inevitable variance depending on the input frequency because of the sampled data nature of the system and the memory mechanism becoming more uncertain with increasing time. In relation to sinusoidal target motions, a similar model is suggested to explain the reduction of latency to the steady-state value soon after the onset of target motion. F.R.L.

A71-25166 # Oscillations of discrete systems (O kolebaniiakh diskretnykh sistem). G. A. Arutiunian, L. Z. Grigorian, and G. A. Serova (Akademiia Nauk Armianskoi SSR, Vychislitel'nyi Tsentr; Erevanskii Gosudarstvennyi Universitet, Yerevan, Armenian SSR). *Akademiia Nauk Armianskoi SSR, Doklady*, vol. 51, no. 3, 1970, p. 182-186. 7 refs. In Russian.

Analysis of the oscillations of a system subject to a discrete control input that experiences delay and is mixed with white noise. The oscillations of the system considered resemble the spectra of eye-pupil diameter changes, hand tremors, and aiming fluctuations during rifle-sighting experiments. Changes in system states are described by a homogeneous Markov chain, and transition probabilities for these states are defined. T.M.

A71-25181 Effects of startle due to pistol shots on control precision performance. D. N. May and C. G. Rice (Southampton, University, Southampton, England). *Journal of Sound and Vibration*, vol. 15, Mar. 22, 1971, p. 197-202. 15 refs.

The effect on control precision performance of startle due to 16 pistol shots of 124 dB peak level was investigated in the laboratory using 14 subjects aged 20-29. It was found that performance was significantly impaired in the two seconds following each bang and not thereafter, but that a lessening of this reaction occurred and was reported by the subjects over the length of the experiment. Some evidence was found for the existence of a critical interval between presentations which was thought to mark the longest period for which subjects in a given situation maintain their expectancy. Evidence was also found that performance when startled is not proportional to a subject's learning skill as it is when startle is not present. (Author)

A71-25199 # Central nervous regulation of intraocular pressure (Die zentralnervöse Regulation des intraokularen Druckes). Thomas Robert Weihrauch. München, Technische Hochschule, Fakultät für Medizin, Doktor der Medizin Dissertation, 1970. 71 p. 237 refs. In German.

A review of the present state of knowledge in the field is presented. The individual elements of the biological self-regulating system which controls the intraocular pressure are identified. They include a receptor which senses pressure fluctuations; fibers of n. trigeminus which convey this sensation to the center; a center in the hypothalamus which, in functional identity with cortical centers, insures a constant pressure adjustment; fibers of n. sympathicus and parasympathicus which convey impulses from the center to the eye; and, finally, intraocular vessels and aqueous chamber secretion which accomplish the necessary pressure change. O.H.

A71-25200 # Problems of oxygen-high pressure treatment giving particular attention to gas gangrene (Probleme der Sauerstoff-Überdruck-Behandlung unter besonderer Berücksichtigung des Gasbrandes). Thomas Alexander von Lieven. München, Technische Hochschule, Fakultät für Medizin, Doktor der Medizin Dissertation, 1970. 71 p. 132 refs. In German.

Basic physiologic and physical factors regarding the concentration of oxygen in the organism are reviewed. The permissible increase of oxygen concentration in the organism obtainable by increasing environmental oxygen pressure is limited because of oxygen toxicity effects. The time-pressure relation is of decisive importance for the hyperbaric oxygenation treatment. Increases in temperature, particularly in the range from 20 to 40 C, greatly enhance oxygen toxicity effects. Cases in which treatment with hyperbaric oxygen might be recommendable are discussed. A cure of patients with Clostridium tetani is not feasible because an application of the required high oxygen pressures would be dangerous. However, a treatment of purpura gangrenosa by hyperbaric oxygenation is possible. Approaches for treating gas gangrene by hyperbaric oxygenation are considered; details regarding the design of the chamber used and the methods of treatment are discussed. G.R.

A71-25236 Predicting the noise of airports. Kenneth Mulholland (Liverpool, University, Liverpool, England) and Keith Attenborough (Open University, Bletchley, Bucks., England). *New Scientist and Science Journal*, vol. 49, Mar. 18, 1971, p. 604-606.

The use of the Noise and Number Index (NNI) for assessing the nuisance level of airports to local residents is examined in terms of precautions which must be taken when interpreting the noise contour maps. The NNI for a given point near an airport is deduced from the logarithmic average of the noise produced by individual aircraft passing overhead (measured in PNdB). It also takes account of the total number of audible aircraft. Procedures used to establish the NNI for projected airports are shown to contain inherent limitations arising from lack of accurate information about aircraft noise and flight paths. The value of NNI contours prepared by these methods is examined from the viewpoint of their significance in interpreting community reaction. T.M.

A71-25237 **'Seeing' cosmic-rays in space.** John Jelley (Atomic Energy Research Establishment, Harwell, Berks., England). *New Scientist and Science Journal,* vol. 49, Mar. 11, 1971, p. 540-542.

Examination of the mechanisms producing flashes of light in human eyes as observed by Apollo astronauts during the periods of their translunar flights. It is suggested that the underlying phenomenon is Čerenkov radiation, perceived as light, due to fast charged cosmic ray particles entering the eyes. In discussing this hypothesis, the essential features of the human eye are described, showing how the cones of Čerenkov light can form in the vitreous fluid of the eye and how it is intercepted by the retina. The possibility of a direct generation of the sensation of light by charged particles is also discussed. O.H.

A71-25254 **A model of visual pre-processing in the retina of the cat.** P. I. Zorkoczy (Essex, University, Colchester, Essex, England). *Computers in Biology and Medicine,* vol. 1, Dec. 1970, p. 97-116. 21 refs.

Review of the physiological and anatomical evidence accumulated in recent years on which a model of retinal information processing in the cat can be based. A quantitative description of the processing of the spatial and temporal features of arbitrary light intensity distributions on the retina is given. The processing of contrast and movement information is formalized and the model is successfully compared with neurophysiological observations. It is shown that the model behaves as an adaptive filter in the time and space domains, with light adaptation as the variable parameter. F.R.L.

A71-25261 # **Medical contribution to the question of loading by frequent takeoffs and landings (Medizinischer Beitrag zur Frage der Belastung durch häufige Starts und Landungen).** Ingeborg Lehwess-Litzmann (Ministerium für Verkehrswesen, Medizinischer Dienst, Berlin, East Germany). *Technisch-ökonomische Informationen der zivilen Luftfahrt,* vol. 6, no. 11, 1970, p. 565-569. In German.

Results of measurements of blood pressure and eye accommodation in crew members of the An-24 after flight tests involving frequent takeoffs and landings. In tests covering internal routes of the GDR statistically significant changes in the measured parameters were noted after the third landing in the case of blood pressure and after the fourth landing in the case of eye accommodation. It is recommended that the work shift of the crew members be limited to six or seven landings with a fairly long pause after the fourth landing for a hot meal. A.B.K.

A71-25281 **Interaction of microwave and radio frequency radiation with biological systems.** Herman P. Schwan (Pennsylvania, University, Philadelphia, Pa.). *(Symposium on Biological Effects and Health Implications of Microwave Radiation, Richmond, Va., Sept. 17, 1968.) IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 146-152. 13 refs. USAF-supported research; NIH Grant No. HE-1253; Contracts No. Nonr-551(05); No. Nonr-551(52).

Equations are presented which summarize previous experimental work and state dielectric constant and conductivity for tissues of high water content as functions of macromolecular content and frequency. Aspects of the depth of penetration of EM radiation are investigated, and the effective cross section of the human body to microwaves is discussed. Nonthermal effects are investigated giving attention to field-force effects, the excitation of biological membranes, and macromolecular resonances. A guideline for future standard work in complex fields is proposed. It is based on the concept of a tolerance current density, which is stated to be near 3 mA/sq cm between 1 and 1000 MHz, and which can be larger above 1000 MHz. G.R.

A71-25282 **Biological function as influenced by low-power modulated RF energy.** Allan H. Frey (Randomline, Inc., Willow Grove, Pa.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 153-164. 67 refs. Navy-supported research.

In recent years it has been recognized that low-power-density modulated RF energy can affect the functioning of higher living organisms. In this paper the sparse data generated in the Western Hemisphere on this subject are considered, the reasons for their sparseness are noted, and the hypotheses on mechanisms that may provide an explanation for the observed effects and other possible effects are sketched. Possible conclusions with regard to hazards to personnel are then considered. (Author)

A71-25283 **Microwave radiation safety standards in Eastern Europe.** Karel Marha (Ústav Hygieny Práce a Chorob z Povolání, Prague, Czechoslovakia). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 165-168. 32 refs.

Research in Eastern Europe on biological effects of microwaves is briefly reviewed and a basic viewpoint involving nonthermal and cumulative effects is presented. Safety standards expressed in terms of dose or irradiation are described based on this viewpoint. It is suggested that differences between these standards and those in the West may become smaller with further study and closer collaboration between researchers in this field. (Author)

A71-25284 **Absence of heart-rate effects in rabbits during low-level microwave irradiation.** Ira T. Kaplan, William Metlay, Milton M. Zaret (Zaret Foundation, Inc., Scarsdale, N.Y.), Leo Birenbaum, and Saul W. Rosenthal (Brooklyn, Polytechnic Institute, Farmingdale, N.Y.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 168-173. 11 refs. Grants No. DA-DA-17-69-G-9288; No. DA-DA-17-69-G-9297; Contract No. AF 44(620)-69-C-0047.

Study in which 16 rabbits were exposed to dorsal irradiation of the head by 2.4-GHz CW microwaves at a power density of 10 mW/sq cm for 20 min. The rest of the animal's body was shielded by absorbent material. There was no significant difference between the heart rate during or after irradiation and the heart rate of the same animals during a control condition in which they were not irradiated. Analysis of the variability in heart rate observed in this experiment suggested that the heart-rate effects reported in a previous Soviet study might have been chance variations. In a second experiment, heart rate, respiration rate, and body temperature were recorded simultaneously while each of two rabbits was irradiated as before, on the dorsal aspect of the head only, at various power densities from 0 to 100 mW/sq cm, in steps of 20 mW/sq cm. Respiration rate increased during irradiation at 40 mW/sq cm, body temperature rose at 80 mW/sq cm, and ultimately the heart rate also increased, but only at 100 mW/sq cm. (Author)

A71-25285 **Evidence for nonthermal effects of microwave radiation - Abnormal development of irradiated insect pupae.** Russell L. Carpenter (U.S. Public Health Service, Northeastern Radiobiological Health Laboratory, Winchester, Mass.) and Elliot M. Livstone (Presbyterian University Hospital, Pittsburgh, Pa.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 173-178. 10 refs. PHS Grant No. GM-09495-03.

Several investigators have reported experiments in which microwave radiation caused biological damage at tissue temperatures which were not harmful when brought about by means other than microwaves. To study the effects of 10-GHz CW radiation on a poikilothermic invertebrate animal, we irradiated early pupae of the mealworm beetle, Tenebrio molitor. Each pupa was inserted in a waveguide and irradiated therein at waveguide powers of 80 mW for either 20 or 30 min or at 20 mW for 120 min, after which their subsequent development was observed. In control groups similarly treated, except that no microwave power was applied, 90 per cent metamorphosed to become normal adult beetles. In the irradiated groups only 24 per cent developed normally, 25 per cent died and 51 per cent developed abnormally. In half of the abnormal animals, the

front half had undergone metamorphosis to form a normal beetle head and thorax but the hind part remained in the pupal state. Temperature increases within pupae were recorded during irradiation. When these thermal conditions were duplicated by means of radiant heating, subsequent development of pupae was normal in 80 per cent of the experiments. We therefore concluded that the abnormalities induced by microwave radiation were not a thermal effect. (Author)

A71-25286 Quantifying hazardous electromagnetic fields - Scientific basis and practical considerations. Paul F. Wacker and Ronald R. Bowman (National Bureau of Standards, Boulder, Colo.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19 Feb. 1971, p. 178-187. 40 refs. Research supported by the U.S. Department of Health, Education, and Welfare.

As commonly recognized, the problem of quantifying hazardous electromagnetic (EM) fields is difficult and has not yet been satisfactorily solved. Essentially, this is because people are often exposed to emanations from powerful sources of EM fields at points close to the sources and at points where arbitrary polarization and multipath interference exist. However, the accepted concepts, standards, and most measuring instrumentation are based on simple plane-wave field propagation and so are inadequate for complicated fields. The complications and problems of quantifying hazardous EM fields involving source-subject coupling, reactive near-field components, multipath components, and arbitrary polarization are examined in some detail. General discussion of dosimetric measurements and hazard survey measurements is given, and also some basic considerations for the design of field probes for these measurements. Recommendations are given for suitable parameters for quantifying complicated EM fields, and essential and desirable characteristics for hazard survey meters are stated. Several recently designed hazard survey probes are capable of measuring these recommended parameters in many complicated fields of interest, and improved instruments are anticipated. (Author)

A71-25287 Induced fields and heating within a cranial structure irradiated by an electromagnetic plane wave. Alan R. Shapiro, Richard F. Lutomirski, and Harold T. Yura (RAND Corp., Santa Monica, Calif.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 187-196. 14 refs.

The induced fields and the static heating patterns within a multilayered spherical model that approximates the primate cranial structure irradiated by plane waves in the microwave spectrum are calculated. The relation of the model to the biological structure and the sensitivity of the results to the uncertainties in the dimensions and electrical properties of biological material are investigated. A method of solution for both the scattered and the interior fields for a sphere with an arbitrary number of electrically different concentric layers is developed in a form readily amenable to machine computation. It is shown that the semiinfinite slab model is inappropriate for calculating the microwave radiation dosage for the human head and similar structures. (Author)

A71-25288 New techniques for implementing microwave biological-exposure systems. Harold L. Bassett, H. Allen Ecker, Richard C. Johnson, and Albert P. Sheppard (Georgia Institute of Technology, Atlanta, Ga.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 197-204. 6 refs.

In investigating the biological effects of microwave radiation, one of the most vexing problems is that of generating an essentially uniform plane wave with sufficient power density for illuminating biological samples. This paper describes three illumination systems: a focused prolate spheroid, an absorber-lined horn, and a compact range. The focused prolate spheroid has two foci: a waveguide feed is located at one, and the biological sample is located at the other. Large power densities can be obtained over an area of about one square wavelength. The absorber-lined horn acts as a small source within an anechoic chamber; such an illumination system reduces errors due to interaction with the biological sample. The compact range employs a reflector and feed system to generate a plane wave across a large aperture; such a range is an attractive device for illuminating large volumes. All three systems can be implemented in a limited space without an anechoic chamber. Experimental data obtained from model systems are presented. (Author)

A71-25289 Analyses of electromagnetic fields induced in biological tissues by thermographic studies on equivalent phantom models. Arthur W. Guy (Washington, University, Seattle, Wash.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 205-214. 15 refs. Research supported by the Social Rehabilitation Service.

One of the most vexing problems in studies involving the interaction of electromagnetic fields and living biological systems and tissues is the quantification of the fields induced in the tissues by nearby sources. This paper describes a method for rapid evaluation of these fields in tissues of arbitrary shape and characteristics when they are exposed to various sources including plane wave, aperture, slot, and dipole sources. The method, valid for both far- and near-zone fields, involves the use of a thermograph camera for recording temperature distributions produced by energy absorption in phantom models of the tissue structures. The magnitude of the electric field may then be obtained anywhere on the model as a function of the square root of the magnitude of the calculated heating pattern. The phantoms are composed of materials with dielectric and geometric properties identical to the tissue structures which they represent. The validity of the technique is verified by comparing the results of the experimental approach with the theoretical results obtained for the case of plane layers of tissue exposed to a rectangular-aperture source and cylindrical layers of tissue exposed to a plane-wave source. This technique has been used successfully by the author for improving microwave applicators. (Author)

A71-25290 Determination and elimination of hazardous microwave fields aboard naval ships. Zorach R. Glaser (National Naval Medical Center, Naval Medical Research Institute, Bethesda, Md.) and Glenn M. Heimer (U.S. Navy, Naval Ship Engineering Center, Hyattsville, Md.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 232-238. 19 refs. Navy-supported research.

A qualitative description of the way that the problems of radio frequency and microwave radiation hazards to personnel aboard naval ships have been handled is presented. The prediction and measurement of microwave fields produced by typical equipment used for communication, command and control, surveillance, fire control, and navigation are discussed. A hazard evaluation survey conducted aboard a fictitious ship, which closely parallels that performed on actual ships, is described. Mentioned are the various methods and techniques used to define and control the potentially hazardous environment which is unique to the Navy. (Author)

A71-25291 Prolongation of life during high-intensity microwave exposures. George M. Samaras, George E. Anderson (U.S. Department of Health, Education, and Welfare, Rockville, Md.), and Lawrence R. Muroff (Columbia Presbyterian Medical Center, New York, N.Y.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-19, Feb. 1971, p. 245-247. 10 refs.

In an attempt to determine whether environmental control would be a feasible and effective tool with which to further investigate microwave bioeffects, we have performed a pilot study. Osborne-Mendel rats were exposed in a lucite environmental chamber, continually flushed with liquid-nitrogen-cooled air. The results of this study indicate that ambient air temperature control can provide a means for prolonging life in test subjects exposed to high-intensity microwave fields. Dosimetric considerations are presented in an attempt to relate heating curves to exposure conditions. (Author)

A71-25292 Microwave cataract. Robert W. Neidlinger (U.S. Army, Medical Research and Development Command,

Washington, D.C.). *IEEE Transactions on Microwave Theory and Techniques*, vol. MTT-19, Feb. 1971, p. 250, 251.

The production of cataract by exposure to microwave radiation can occur, although just how it occurs is not well established. Clarification as to the occurrence of cataract in microwave worker population can only be achieved by careful cumulative records of the visual and ophthalmological status of microwave worker populations. (Author)

A71-25293 Analeptic effect of microwave irradiation on experimental animals. R. D. McAfee (U.S. Veterans Administration Hospital, New Orleans, La.). *IEEE Transactions on Microwave Theory and Techniques*, vol. MTT-19, Feb. 1971, p. 251-253. 14 refs.

Available experimental data for the microwave-induced effect of increased alertness (or arousal from sleep and anesthesia) in irradiated animals are evaluated to discover the relative significance of frequency, modulation, power density, and location of the affected area. It is concluded that this analeptic effect involves indirect stimulation of the reflex and arousal centers in the brain and spinal cord by way of the peripheral nervous system. The afferent peripheral nerves are thermally stimulated by the radiation. T.M.

A71-25362 Behavioural and EEG changes during and after 14 days of perceptual deprivation and confinement. John P. Zubek (Manitoba, University, Winnipeg, Manitoba, Canada). In: Readings in general psychology: Canadian contributions. Edited by A. W. Pressey and J. P. Zubek. Toronto, McClelland and Stewart, Ltd., 1970, p. 165-171. 16 refs. Defence Research Board Grant No. 9425-08; National Research Council Grant No. APA-290.

Effects of prolonged separation from accustomed environment are studied by appraising a wide range of reactions involving various behavioral, physiological, and chemical measures. The subjects were exposed to a condition of constant unpatterned light and white noise (hissing sound). Considerable disturbances of brainwave activity, with effects still discernible 10 days later, were observed for all ten subjects tested; however, the decrease in alpha frequency varied from 0.26 to 3.56 Hz for the individual subjects. V.P.

A71-25435 A new technique for measurement of cardiac output by thermodilution in man. William Ganz, Roberto Donoso, Harold S. Marcus, James S. Forrester, and Harold J. C. Swan (California, University, Los Angeles, Calif.). *American Journal of Cardiology*, vol. 27, Apr. 1971, p. 392-396. 14 refs. Research supported by the Los Angeles County Heart Association and the United Hostesses Charities; PHS Contracts No. PH-43-68-1333; No. HE-12337; No. HE-10382.

Simultaneous measurements of cardiac output by thermal and dye-dilution methods were performed during the process of routine right heart catheterization. There was close agreement of the two methods in a range of values from 2.9 to 8.0 liters/min. The reproducibility of measurements was 4.1% with the thermo-dilution and 5.4% with the dye-dilution technique. The thermodilution technique does not require withdrawal of blood during measurements and removal of blood for calibration. The calibration is simple and accurate. There is virtually no recirculation, so that a simple integrator can be used for determination of the area beneath the thermodilution curve. G.R.

A71-25436 Percutaneous access to implanted electrodes. David A. Nathan, John W. Lister, J. Walter Keller, Rafael Castillo, and Arthur J. Gosselin (Miami Heart Institute, Miami Beach, Fla.). *American Journal of Cardiology*, vol. 27, Apr. 1971, p. 397-406. 14 refs.

The system developed is compatible with virtually any electrode or pacer configuration and provides reliable, repeatable measurements. It involves a subcutaneous metal plaque covered with self-sealing silicone rubber, and a special percutaneous needle. The plaque may be connected to the implanted electrode or the pacer electrode terminal, or incorporated within the electrode connector assembly or the pulse generator. The needle, made of hardened alloy, is covered entirely with Teflon except for the extreme tip, and thus is insulated from the tissues. G.R.

A71-25437 Control of myocardial oxygen consumption - Physiologic and clinical considerations. Eugene Braunwald (California, University, La Jolla, Calif.). *American Journal of Cardiology*, vol. 27, Apr. 1971, p. 416-432. 54 refs. NIH Grant No. HE-12373; PHS Contract No. PH-43-68-1332.

A review is given of work conducted to identify and measure those aspects of cardiac activity responsible for the difference between the basal levels of oxygen consumption and those occurring during the heart's activity. Oxygen requirements of myocardial depolarization and of myocardial contraction are examined. Studies on cat papillary muscles are reported, and investigations regarding oxygen consumption and energy phosphate costs of contraction are considered. Pathophysiologic and clinical implications of the investigations are explored, and studies regarding valvular regurgitation, heart failure, angina pectoris, myocardial infarction, and counterpulsation are described. G.R.

A71-25583 # Intensity threshold changes during voluntary saccade of the eyes in the presence of regions of different luminance in the visual field. L. Mitrani, S. Mateev, and N. Iakimov (B'lgarska Akademiia na Naukite, Fiziologicheski Institut, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady*, vol. 23, no. 12, 1970, p. 1577-1579.

Study of the causes of so-called visual suppression and changes in intensity thresholds accompanying voluntary saccades of the eyes. The investigation consisted in experiments with human subjects using a light stimulus whose parameters were varied. The results suggest, in addition to the short-range lateral interactions familiar from previous research, the operation of certain inhibition processes over longer distances during voluntary saccades. These processes are believed to be responsible for both the changes in intensity thresholds and visual suppression during the saccades. M.V.E.

A71-25595 A digital recording system for respiration variables. G. W. Bradley and Khatim Y. Mustafa. *Respiration Physiology*, vol. 11, Mar. 1971, p. 390-398. 7 refs.

A method is described which enables various respiratory parameters to be presented in digital form. It consists of processing analog signals from conventional recording apparatus using operational amplifier circuits and a Devices Digitimer. The final signals are put into a Biomac 500 computer, which is used as an analog-to-digital converter with storage facilities, and the digital reading is printed out using a teletype. Depending on the number of inputs, analyses of 125-500 breaths is possible before the results have to be printed out. Examples of how the method may be applied to the measurement of the respiratory response to elastic loading in cats and to rebreathing in rabbits and man are given. (Author)

A71-25619 # Certain properties of variable-structure biomechanisms (Niektóre własności biomechanizmów o zmiennej strukturze). Kazimierz Fidelus (Warszawa, Politechnika, Warsaw, Poland) and Adam Morecki (Akademia Wychowania Fizycznego, Warsaw, Poland). *Mechanika Teoretyczna i Stosowana*, vol. 9, no. 1, 1971, p. 73-88. 7 refs. In Polish.

Structural and functional analysis of muscular drive mechanisms in the upper and lower extremities of humans and horses. Classes and functions of muscles are related to the type and location of joints in the extremity. Certain general rules are derived for the synthesis of extremity-type biomanipulators from the viewpoint of reduced dimensions, weight, energy expenditure, and control complexity. T.M.

A71-25626 # The importance of energy storage for the late phase of the muscle twitch. R. A. Chaplain (Magdeburg, Technische Hochschule, Magdeburg, East Germany). *Acta Biologica et Medica*

Germanica, vol. 26, no. 1, 1971, p. 1-8. 15 refs.

Investigation of thermoelastic heat, released during the fall of tension from active muscle and passive rigor muscle. It revealed the existence of a fraction of stored energy which is liberated together with the true thermoelastic heat from active muscle. The amount of energy stored is directly proportional to the tension in the muscle. After-loaded isotonic releases were carried out on relaxing muscles under conditions where these muscles could still actively shorten against various loads in the absence of any ATP splitting. It was found that the relative mechanical power output actually increased, but that the shortening heat rates at low fractional loads were much reduced compared with those in the early part of the muscle twitch. It appears that the particular fraction of energy storage identified may be utilized to support redevelopment of tension and mechanical power output in the late phase of the twitch, and that ATP hydrolysis itself contributes some heat. F.R.L.

A71-25627 # **A fluorometric micromethod for rapid determination of unconjugated 11-hydroxycorticosteroids in plasma (Eine fluorometrische Mikromethode zur schnellen Bestimmung der unkonjugierten 11-Hydroxykortikosteroide im Plasma).** D. Keibel and G. Neumann (Forschungsinstitut für Körperkultur und Sport, Leipzig, East Germany). *Acta Biologica et Medica Germanica,* vol. 26, no. 1, 1971, p. 45-50. 34 refs. In German.

A new method is described in which as little as 100 microliters of plasma are necessary for an analysis. Experiments carried out on sportsmen using this method showed a normal distribution of unconjugated 11-hydroxycorticosteroids in plasma, with a mean value of 12.8 plus or minus 2.8 micrograms per 100 milliliters. It was also found that there are no differences in 11-hydrocorticosteroid concentrations between capillary and venous blood. The reliability and rapidity of determination make this method suitable for routine application. O.H.

A71-25634 **Fluorescent glucoside in the human lens.** Ruth van Heyningen (Oxford University, Oxford, England). *Nature,* vol. 230, Apr. 9, 1971, p. 393, 394. 13 refs.

The O-beta-D-glucoside of L-3-hydroxykynurenine, a yellow and highly fluorescent pigment, was isolated from a protein-free dialysate extract of the human lens. The collected fluorescent material was concentrated to dryness in vacuum. The yellow deposit was dissolved in a little water, and the highly flourescent solution was streaked onto paper and subjected to electrophoresis at pH 1.6. One main and several subsidiary fluorescent bands separated, all positively charged at pH 1.6. Subsequent treatment of the main band provided a yield of the fluorescent glucoside which corresponds to a concentration of about 0.65 micromol/g of fresh lens. T.M.

A71-25635 **Effect of a bright light flash on dark adaptation of human rods.** Mathew Alpern (Michigan, University, Ann Arbor, Mich.). *Nature,* vol. 230, Apr. 9, 1971, p. 394-396. 17 refs.

A brief flash of bright light bleaches half the rhodopsin in the rods of the human eye, although Rushton (1963) found it as effective as a full long bleach in elevating the rod threshold. This is a paradox because there is a linear relation between the fraction of visual pigment still unregenerated and the log threshold in the dark after a full long bleach. This paradox was explained by Dowling and Hubbard (1963) whose experiments with rats showed a partial overlapping of the rhodopsin regeneration curves during adaptation to the dark for full-bleach and flash exposures. Present experiments conducted with monochromat subjects made it possible to study a wider range of the rod recovery process. The results show that rhodopsin resynthesis curves after the flash and long-bleach exposures (which produce identical rod dark adaptation curves) never overlap. Thus, the explanation of Dowling and Hubbard does not resolve Rushton's paradox in man according to the present results. T.M.

A71-25667 # **Hypothalamus and allergic processes (Gipotalamus i alergichni protsesi).** O. F. Makarchenko, G. D. Dinaburg, and B. A. Roitrub (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Jan.-Feb. 1971, p. 3-7. 14 refs. In Ukrainian.

Physiological and biochemical changes arising in allergic reactions are similar to those observed in patients with vegetative and vascular diencephalic syndromes. It can be assumed that disorders in hypothalamic neurohumoral regulation play an important role in the simultaneous disruption of different systems in the organism during allergic reactions. While not identifying diencephalic syndrome diseases with true allergic diseases, it is stressed that pathological impulsation from peripheral receptor apparatuses has considerable influence in both. It is possible that proteins which underwent macrostructural changes during diencephalic syndromes become autoantigens conditioning the development of autoallergies with prolonged chronic symptoms, relapses, and exacerbations. T.M.

A71-25668 # **Change in the functional activity of the central nervous system in youthful athletes (Zmina funktsional'noi aktivnosti tsentral'noi nervovoi sistemi u iunikh sportsmeniv).** T. M. Tsoneva, G. F. Al'okhina, V. P. Daniliuk, and A. I. Dudnik (Odes'kii Pedagogichnii Institut, Odessa, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Jan.-Feb. 1971, p. 33-38. 8 refs. In Ukrainian.

Changes in the responsiveness of the central nervous system after exhausting physical exercise were studied in 11- to 12-yr-old subjects divided into groups consisting of participants and nonparticipants in regular sports activities. Electroencephalogram and sensomotor reaction records were taken at rest, after a maximum-speed 10-sec run, and after bicycle exercise. The athletic subjects could sustain greater physical stress under conditions of deteriorated neurodynamic responses and deactivated cortical structures. Athletes who reacted to a limited physical stress after exhausting exercise by reactivation of cortical structures and by improvement of neurodynamic indices show higher endurance to physical loads. T.M.

A71-25669 # **Water metabolism and digestive glands (Obmin vodi i travni zalozi).** B. E. Esipenko (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Jan.-Feb. 1971, p. 47-56. 36 refs. In Ukrainian.

Secretory function intensity of the salivary glands, liver, and stomach was studied in dogs, rabbts, mice, and humans during different conditions imposed on the water-salt metabolism (single repletion with water, prolonged repletion with water over several days, and dehydration). The imposed conditions strongly influenced the water content of digestive gland secretions. The results are used to characterize the water secretion function of digestive glands which plays an important role in maintaining the water-salt homeostasis of organisms. Different series of tests with animals established the casual nature of changes in the secretion of digestive juices, particularly the water level at different states of the water-salt metabolism. T.M.

A71-25670 # **Comparative study of tissue respiration in heterothermic and homothermic animals under hypoxia (Porivnial'ne vivchennia tkaninnogo dikhannia geterotermnikh i gomoiotermnikh tvarin pri gipoksii).** N. M. Shumits'ka and E. V. Kolpakov (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Jan.-Feb. 1971, p. 62-67. 66 refs. In Ukrainian.

Hemopoiesis and respiration were studied in gas media containing 1.3 to 1.8% oxygen, in slices of cerebrum, cerebellum, liver, kidney, myocardium and diaphragm tissue taken from Citellus suslicus rodents and albino rats after 180 hr exposures to altitudes from 7.5 to 8.5 km in a pressure chamber. Under conditions close to extremal, the oxygen consumption of cerebral tissues (in both genuses) and myocardium tissues (in rats) was slightly higher in altitude-adapted animals than in control animals. V.Z.

A71-25671 # **Change in the afferent pulsed activity of the phrenic nerve under asphyxia (Zmina aferentnoi impul'snoi aktivnosti v diafragmal'nomu nervi pri asfiksii).** A. S. Drach

(Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Jan.-Feb. 1971, p. 68-73. 21 refs. In Ukrainian.

Acute experiments were conducted on anesthetized cats to investigate the afferent pulsed activity of the peripheral fibers of a severed phrenic nerve during inhalation of air and during the development of various phases of asphyxia. Two different modes of this activity were established in the nerve fibers during the inspiration and expiration phases of spontaneous respiration. Afferent pulsed activity synchronous with the expiration phase was found to be sustained in the fibers during all phases of asphyxia. It was also found that information concerning the activity of the diaphragm was delivered to the centers over the afferent fibers of a severed phrenic nerve even during a severe oxygen deficiency. V.Z.

A71-25672 # Measurement of ultraweak luminescence in biological objects (Pro vimiriuvannia nadslabkikh svitin' biologichnikh ob'ektiv). B. R. Kirichins'kii, E. Z. Riabova, Ia. I. Serkiz, and E. Iu. Chelotar'ov (Akademiia Nauk Ukrains'koi RSR, Institut Mikrobiologii i Virusologii; Kiivs'kii Institut Eksperimental'noi i Klinichnoi Onkologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Jan.-Feb. 1971, p. 126-130. 11 refs. In Ukrainian.

The nature and characteristics of chemiluminescence of biological tissues - spontaneous and produced by X-rays, gamma bombardment or heating - are discussed, noting the recent advances of radio engineering facilitating highly sensitive luminescence measurements. Techniques for sensitivity enhancement and noise level reduction in available equipment and for measurement of biological luminescence spectrum composition are described. A block diagram is given for a Soviet-made assembly for recording extremely weak biological luminescence. The quantum-counting assembly uses photomultipliers with a spectral sensitivity ranging from 160 to 600 nm and interchangeable universal and liquid-specimen sensors. Several photomultipliers can be used in these sensors to expand the effective range of the assembly from the UV end to the IR end of the spectrum. V.Z.

A71-25701 * Vegetative life on Venus - Or investigations with algae which grow under pure CO2 in hot acid media and at elevated pressures. Joseph Seckbach and W. F. Libby (California, University, Los Angeles, Calif.). In: Planetary atmospheres; International Astronomical Union, Symposium, 40th, Marfa, Tex., October 26-31, 1969, Proceedings. Symposium supported by the Martin Marietta Corp., the National Science Foundation, and the University of Texas. Edited by Carl Sagan, T. C. Owen, and H. J. Smith. Dordrecht, D. Reidel Publishing Co. (IAU Symposium, No. 40), 1971, p. 62-83. 57 refs. Grants No. AF AFOSR 1255-67A; No. NGL-05-007-003.

Description of experiments with algae grown in a new environment of pure carbon dioxide under pressure and in an acidic nutrient medium at elevated temperatures. Studies with Cyanidium caldarium showed that this acidic hot-spring alga thrives in pure carbon dioxide and under high pressures. If Venus has acidic polar seas, they may harbor photosynthetic life. F.R.L.

A71-25929 Impedance and transmission properties of the pulmonary arterial system. S. R. Reuben, J. P. Swadling, G. de J. Lee (Radcliffe Infirmary, Oxford, England), and B. J. Gersh. *Cardiovascular Research,* vol. 5, Jan. 1971, p. 1-9. 10 refs. Research supported by the British Heart Foundation and the Medical Research Council.

Simultaneous measurements of instantaneous pulmonary arterial input pressure and flow were compared with lung capillary blood flow in 13 closed-chested dogs. Vasoconstrictor effects of hypoxia and serotonin infusion were shown to cause major alterations in the normal input impedance spectrum of the pulmonary arterial system. In spite of this, the transmission ratio of flow pulsatility from the main pulmonary artery to the lung capillaries remained unaltered, indicating that the time constant of the pulmonary arterial system is self-regulating. (Author)

A71-25930 The series elasticity of heart muscle during hypoxia. A. H. Henderson, W. W. Parmley, and E. H. Sonnenblick (Peter Bent Brigham Hospital, Boston, Mass.). *Cardiovascular Research,* vol. 5, Jan. 1971, p. 10-14. 16 refs. Research supported by the American Heart Association and PHS.

Using papillary muscle preparations from rat hearts, the compliance of the series elastic element was shown to be decreased during hypoxia. Series elastic compliance was decreased only under conditions resulting also in an alteration of resting length-force relations. It reverted to normal on reoxygenation. (Author)

A71-25931 Haemodynamic and pathological study of the effect of chronic hypoxia and subsequent recovery of the heart and pulmonary vasculature of the rat. A. S. Abraham, J. M. Kay, R. B. Cole, and A. C. Pincock (Birmingham, University, Birmingham, England). *Cardiovascular Research,* vol. 5, Jan. 1971, p. 95-102. 17 refs. Research supported by the British Heart Foundation, the United Birmingham Hospitals, and the Wellcome Trust.

It is shown that when rats are exposed to chronic hypoxia in a decompression chamber they develop an increase in right ventricular mean pressure, right ventricular hypertrophy, and a characteristic form of hypertensive pulmonary vascular disease. The pulmonary vascular lesions consist of muscularization of the pulmonary arterioles, accompanied in a proportion of rats by media thickening of the smaller muscular pulmonary arteries. When the animals are removed from the hypoxic environment, there is a progressive reduction of the right ventricular pressure and a regression of the pulmonary vascular disease. The results show that in rats the pulmonary hypertension and associated pulmonary vascular disease induced by chronic hypoxia are reversible. The findings support the hypothesis that the organic basis for the pulmonary hypertension in human subjects with chronic hypoxia is a muscularization of the small pulmonary arterial vessels, and that removal of the hypoxia produces regression of the pulmonary vascular changes and associated pulmonary hypertension. (Author)

A71-26055 * Replication of spleen lymphocytes in the young rat, in vivo. J. Post (New York University, New York, N.Y.) and J. Hoffman (Goldwater Memorial Hospital, Welfare Island, N.Y.). *Experimental Cell Research,* vol. 60, 1970, p. 103-108. 20 refs. PHS Grant No. 5R01 CA-03917-11; AEC Grant No. AT (30-1)-2778; Grant No. NGR-33-016-102.

The effects of tritiated-thymidine upon the renewal of large and small splenic lymphocytes were investigated. The average generation time was found to be about 12 hr. Small and large lymphocytes replicate independently. Many lymphocytes which synthesize DNA leave the spleen prior to completion of the cycle. There is a resident population of lymphocytes, arrested in G2, from which some of the newly formed cells are derived. O.H.

A71-26071 * Muscle training and blood flow. Masahiro Kaneko, R. F. Walters, and L. D. Carlson (California, University, Davis, Calif.). *Journal of Sports Medicine and Physical Fitness,* vol. 10, Sept. 1970, p. 3-14. 13 refs. Grant No. NGR-05-004-026.

The influence of isotonic and isometric training procedures on circulation in the trained muscle was tested with nine male subjects from 18 to 21 years old. Muscle circumference, maximum tension, and force and velocity during contraction were used as indices of change in muscle characteristics. Isotonic, isometric, and arterial occlusions were used as test functions for circulatory responses, and measurements were taken of the blood flow and venous compliance. The training was sufficient to increase muscle strength and mass. Circulatory changes varied with the conditioning procedure and the test. T.M.

A71-26073 * The control of initiation of food intake by body-fluid osmolality. Jan W. Kakolewski (Fels Research Institute, Yellow Springs, Ohio) and Edward Deaux (Antioch College, Yellow Springs, Ohio). *Communictions in Behavioral Biology,* vol. 5, Nov. 1970, p. 191-194. 19 refs. NSF-supported research; NIH Grant No.

M-4529; Grant No. NGL-36-005-001.

Rehydrated rats are found to initiate consumption of a meal when body-fluid osmolality decreases. If at the time the animal is ready to initiate eating, the body-fluid osmolality is increased by injection of a hypertonic sodium chloride solution, no eating occurs. If rats are given the opportunity to consume a hypertonic sodium chloride solution in the place of food, they will ingest the solution and decrease subsequent food intake. Thus, it is demonstrated that a decrease in body-fluid osmolality is an essential cue for the initiation of food ingestion. Z.W.

A71-26074 * Sex differences in body weight regulation in rats following lateral hypothalamic lesions. Verne C. Cox and Jan W. Kakolewski (Fels Research Institute, Yellow Springs, Ohio). *Communications in Behavioral Biology*, vol. 5, Nov. 1970, p. 195-197. 6 refs. NIH Grant No. M-4529; Grant No. NGL-36-005-001.

Following lateral hypothalamic lesions, female rats, unlike male rats, rapidly recover normal body weight levels. After an initial period of body weight loss, female rats display supranormal weight gains until they recover normal weight levels. (Author)

A71-26075 Scanning strategies and differential sensitivity in a visual signal detection task - Intrasubject reliability. David E. Clement and Karen E. Hosking (South Florida, University, Tampa, Fla.). *Psychonomic Science*, vol. 22, Mar. 25, 1971, p. 323, 324. 5 refs.

Four Ss (two of each sex) were run on 960 trials of a 16-alternative forced-choice visual signal detection task. Analysis of variance of d prime values indicated the usual practice effects, as well as differential sensitivity to different target locations, and three significant interactions. Despite the significant changes in magnitude of d prime, each S demonstrated consistency in the ordering of sensitivity as a function of target location across blocks of 320 trials (W = .51, .76, .85, and .81). The data imply extremely strong scanning biases which existed prior to the experimental task and further suggest that less than 400-500 trials is quite sufficient for reliable estimation of differential sensitivity among all 16 target locations in a 16-AFC task. (Author)

A71-26076 Judgments of body and object verticality in the presence of discordant visual information. Jan Mottram and G. Singer (MacQuarie University, Sydney, Australia). *Psychonomic Science*, vol. 22, Mar. 25, 1971, p. 365-367. 6 refs.

An experimental assessment is attempted of the degree of visual dominance in judgments of body and object verticality as a function of varying amounts of nonvisual information. In the body verticality experiments, vision is opposed to the combined weight of information from the vestibular, proprioceptive, and kinesthetic modal systems of the body. In the object-verticality experiments, where the object (a bar) is in contact with the subject's right hand, vision is opposed to a subsystem of the kinesthetic modality only. The results obtained indicate that the degree of visual dominance is, at least partially, a function of the amount of nonvisual information provided by other modalities, but that the relationship of the interaction of modal systems is of considerable complexity. M.V.E.

A71-26114 Coronary hemodynamic responses to postural changes in hemorrhaged dogs. C. T. Liu, R. A. Huggins, and H. E. Hoff (Baylor University, Houston, Tex.). *Aerospace Medicine*, vol. 42, Apr. 1971, p. 379-383. 15 refs. PHS Grant No. HE-05435.

Observation that when anesthetized dogs were tilted to head-up 45 deg from horizontal for three minutes, the left coronary flow was decreased initially and returned to control level after a transient increase. Although the coronary resistance was decreased 30 minutes after hemorrhage to a blood pressure of 70 to 80 mm Hg, the coronary flow was not significantly altered. When the hemorrhaged dog was subjected to a 45 deg head-up tilt, the magnitude of initial drop in coronary flow compared to control dog was increased, but the flow soon rose to the pretilt level. In control or hemorrhaged dogs subjected to a 45 deg head-down tilt, the blood pressure, coronary flow, and coronary resistance remained unchanged. Upon blood reinfusion to the hemorrhaged dogs the coronary responses to either head-up or head-down tilts were not significantly different from the control animals within an hour. (Author)

A71-26115 # Role of anthropology in Air Force systems. Milton Alexander, John W. Garrett, and Joan C. Robinette (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Aerospace Medicine*, vol. 42, Apr. 1971, p. 388-393. 27 refs.

System design has not always begun with proper allowances for the human operator. If a system is placed in high altitude operation without sufficient accommodations for a man wearing a full pressure suit there are then only three alternatives available: first, to decrease the amount of protective equipment worn by the operator which results in a less bulky, less encumbered, but less protected man; second, to limit the pilot population to smaller individuals, appreciably reducing the available pilot pool; and third, to redesign the cockpit furniture and retrofit the cockpit at considerable expense in time and money. Each of these alternatives obviously results in a considerable degradation of the system. To alleviate these problems altogether it is essential that design engineers laying out tomorrow's aircraft cockpits work in close liaison with the pressure-suit developers to assure a system compatible with mission requirements. (Author)

A71-26116 Two-flash thresholds as a function of comparison stimulus duration. Mark F. Lewis and Henry W. Mertens (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aerospace Medicine*, vol. 42, Apr. 1971, p. 393-395. 12 refs.

Experimental test of the proposal that two-flash thresholds may be used as direct measures of the critical duration of Bloch's law. Two-flash threshold was found to be an increasing function of comparison stimulus duration for durations of 3 to 22 msec indicating that two-flash threshold does not measure the critical duration. Increasing luminance in the range of 1.0 to 3.0 log mL. enhanced the effect. Application of these data to specifications for strobe lights used as anticollision devices is discussed. (Author)

A71-26117 Use of skin temperature to predict tolerance to thermal environments. P. F. Iampietro (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aerospace Medicine*, vol. 42, Apr. 1971, p. 396-399. 14 refs.

Use of skin temperatures and tolerance times from several studies in an attempt to establish a relationship between (1) final skin temperature and tolerance time and (2) skin temperature during the early minutes of exposure and final skin temperature. The number of subjects during each exposure ranged from five to ten. Exposure temperatures ranged from -4 to 113 C (25 to 235 F). Many criteria were used to fix tolerance time: for hot exposures rectal temperature, 39.2 C (102.5 F); heart rate, 180 beats/min; nausea, etc. were used; for cold exposures toe temperatures below 4.4 C (40 F) and subjective evaluations were used. A relationship exists between final temperature and tolerance time and between final skin temperature and skin temperature at 10 minutes of exposure. Final skin temperature (at tolerance) in hot and cold environments can be predicted from the skin temperature at 10 minutes. Tolerance time may also be estimated from the 10-minute skin temperature. (Author)

A71-26118 Effect of antihistamine on early transient incapacitation of monkeys subjected to 4000 rads of mixed gamma-neutron radiation. T. F. Doyle, J. E. Turns, and T. A. Strike (Defense Atomic Support Agency, Armed Forces Radiobiology Research Institute, Bethesda, Md.). *Aerospace Medicine*, vol. 42, Apr. 1971, p. 400-403. 7 refs.

An antihistamine, chlorpheniramine maleate, was used in monkeys to ameliorate the severe hypotension and to prevent signs of the early transient incapacitation (ETI) frequently associated with supralethal doses of ionizing radiation. Twenty-five monkeys (Macaca mulatta) were given 4000 rads of mixed gamma-neutron

radiation delivered as a single pulse of approximately 50 milliseconds duration. Eight of the animals served as controls and received only normal saline injections; 10 animals were each injected with 10 mg of the antihistamine 30 minutes before irradiation; and a third group of seven animals each received 10 mg of antihistamine 60 minutes before irradiation plus 10 mg of antihistamine 30 minutes before irradiation. Blood pressure was monitored from time of injection until death, and clinical symptoms were recorded until 1 hour after irradiation. All but one of the antihistamine-treated animals remained alert and responsive to auditory stimuli with no evidence of ETI. The control animals became unconscious and unresponsive and suffered a longer and more severe hypotension than the antihistamine-treated animals. The average survival time of the antihistamine-treated animals was significantly greater than that of the control animals. (Author)

A71-26119 Traumatic shock - Evidence for chemical release from traumatized tissue in dogs. C. T. Liu (Baylor University, Houston, Tex.). *Aerospace Medicine,* vol. 42, Apr. 1971, p. 403-407. 38 refs. Research supported by the Texas Heart Association; PHS Grant No. HE-05435.

When the blood of two dogs was cross-circulated for 2 hours, a simultaneous reduction of carotid blood flow with little change in the mean arterial blood pressure occurred. Tachycardia and a decreased cardiac contractile force were also observed. Using the technique of cross-circulation, after one dog was traumatized to a blood pressure of 60-70 mm Hg, both dogs showed similar reduction of blood pressure and carotid blood flow. Tachycardia and cardiac depression were demonstrated in the untraumatized dog who died approximately 13 min earlier than the traumatized dog. The data suggest that some substances were released from the damaged tissue and that cardiac depression was the main cause of death. (Author)

A71-26120 # Psychobiologic effects of prolonged weightlessness (bed rest) in young healthy volunteers. Ralph S. Ryback, Ralph W. Trimble, Oliver F. Lewis, and Charles L. Jennings (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *(American Psychiatric Association, Meeting, San Francisco, Calif., May 11-15, 1970.) Aerospace Medicine,* vol. 42, Apr. 1971, p. 408-415. 61 refs. USAF-sponsored research.

The lack of knowledge of the effects of weightlessness has made scientists apprehensive about putting a man in space for prolonged periods of time. At the present time prolonged bed rest is the best method for simulating prolonged weightlessness. Eight airmen aged 18 to 22 years participated in the bed rest study. The experiments suggest that prolonged bed rest may be understood as a more subtle form of sensory deprivation. It is suggested that the deprivation observed here is not just environmental as related to the five senses, but somatic in terms of a decrease in-put neurologically from the muscular system per se. It is proposed that the alert, normal, intelligent, adaptive homeostatic state in man requires a continuous variation in sensory and motor-muscular in-put. The significance of this study for the acutely bedridden or convalescing patient is seen as the psychological and physiological stress that prolonged bed rest produces. (Author)

A71-26121 * Some effects of drugs on the low frequency whole body vibration response of dogs. Charles E. Evces and James H. McElhaney (Alabama, University, University, Ala.). *Aerospace Medicine,* vol. 42, Apr. 1971, p. 416-420. Grant No. NsG-533.

Possible alterations in the whole body vibration response of dogs due to the influence of drugs was investigated. A system was constructed which permitted response measurements of unanesthetized dogs for comparison with drugged response. Animals were subjected to a sinusoidal acceleration environment of 1 g magnitude over a frequency range of 2 to 15 cps. Preliminary results for phenobarbital (50 mg/kg ip), phenoxybenzamine (20 mg/kg ip), morphine (15 mg/kg im), and undrugged responses were obtained in the form of mechanical impedance response curves. These results were interpreted in terms of an equivalent one degree of freedom system. The results indicated that drugs can produce measurable changes in whole body vibration response which might be used to help isolate the mechanism of drug induced changes in vibration tolerance. These changes appeared in the form of decreased stiffness and damping, and reduced energy dissipation within the body. (Author)

A71-26122 Instantaneous postural reaction of cattle to brain concussion. S. R. Govons (Edward W. Sparrow Hospital, Lansing, Mich.) and R. A. Merkel (Michigan State University, East Lansing, Mich.). *Aerospace Medicine,* vol. 42, Apr. 1971, p. 421-423. 12 refs.

The instantaneous postural reactions of unanesthetized cattle to concussive head blows were recorded on moving film. A predictable reflex pattern was demonstrated in the interval between the blow and the loss of posture. The demonstration of intense reflex activity suggests that a massive, high frequency discharge of impulses from mechanoreceptors into the brainstem and upper cervical cord may be the pathophysiological mechanism underlying brain concussion. (Author)

A71-26123 * Blood volume changes in divers of Tektite I. Philip C. Johnson (Baylor University; Methodist Hospital, Houston, Tex.), T. D. Driscoll (Baylor University; NASA, Manned Spacecraft Center, Houston, Tex.), and Craig L. Fischer (NASA, Manned Spacecraft Center, Clinical Laboratories, Houston, Tex.). *Aerospace Medicine,* vol. 42, Apr. 1971, p. 423-426. 10 refs. PHS Grant No. HE-05435; Contract No. NAS 9-7280.

Plasma volume, red cell mass and red cell survival determinations were performed for the four aquanauts who lived sixty days at a 12.8 meter sea depth in the habitat of Project Tektite I. No change in red cell mass or red cell survival was found. Environmental temperature induced plasma volume increases were found predive and additional plasma volumes increases were found at the end of the dive before and after decompression. (Author)

A71-26124 Inability of succinate to protect rats from the chronic effects of hyperbaric oxygen toxicity. M. K. Kowalski, Archie Ashley, and G. H. Kydd (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *Aerospace Medicine,* vol. 42, Apr. 1971, p. 427-432. 20 refs.

Rats of the Sprague-Dawley strain obtained from the Huntingdon Farms Company, Philadelphia, were succinate protected toward the acute effects (convulsions) of oxygen toxicity and exposed to 5 ata, 100% oxygen to ascertain if protection also existed against the chronic effects (paralysis). The data obtained on 18 succinate-injected rats as compared with 18 corresponding controls indicated that no significant resistance to paralysis was present. Thus paralysis due to OHP did not require previous convulsive episodes. The continuous monitoring of body temperature, measured rectally throughout the exposure presented no correlation between convulsions and temperature variation. However, a characteristic type of temperature decrease did appear directly preceding or with the onset of paralyses. This characteristic temperature profile was essentially the same for both the succinate-protected and non-protected rats during the exposure in which paralyses occurred, indicating the mechanistic centers of temperature control and paralyses were affected similarly by OHP and that succinate did not influence these centers significantly. (Author)

A71-26125 Inhibition of dehydrogenase activity in lung tissue due to breathing oxygen at atmospheric pressure. D. Bardell and A. K. Fowler (New Hampshire, University, Durham, N.H.). *Aerospace Medicine,* vol. 42, Apr. 1971, p. 432-435. 12 refs.

Exposure to oxygen at ambient pressure caused a marked decrease in dehydrogenase activity of mouse lung tissue prior to gross or microscopic evidence of pulmonary damage. This decrease in activity was significant after two hours, and was progressive with increasing exposure time. Evidence indicates that inhalation of oxygen may affect succinic dehydrogenase less than it does other dehydrogenases of lung tissue. Inhibition of dehydrogenase activity

by exposure to oxygen is persistent, and the time required for a return to normal activity is relatively long compared to the exposure period. Pretreatment with pentobarbital sodium protected dehydrogenase activity in lung tissue from inhibition by oxygen at atmospheric pressure. (Author)

A71-26126 • Effect of acetylsalicylic acid and ascorbic acid on oxygen toxicity. Scott Serrill, Devenia Jefferson, Jacqueline Quick, and Charles E. Mengel (Missouri, University, Columbia, Mo.). *Aerospace Medicine,* vol. 42, Apr. 1971, p. 436-438. 6 refs. NASA-supported research; PHS Grants No. CA-11446; No. CA-11447; Contract No. N 00014-67-A-0003.

Exploration of the effects of some common drugs with redox potential on oxygen toxicity. Acetylsalicylic acid and ascorbic acid were injected into chow-fed and tocopherol-deficient mice. In vitro lysis of red blood corpuscles by H2O2 increased from 40 plus or minus 2% to 64 plus or minus 7% in chow-fed and from 60 plus or minus 3% to 90 plus or minus 2% in tocopherol-deficient mice, 60 minutes following injection. A linear response between drug dose and H2O2 lysis existed. During exposure to 100% O2 at 45 psia, drug-treated and tocopherol-deficient mice began seizures and died much sooner than did controls. These data (1) show increased red blood corpuscle lytic sensitivity to H2O2 from mice treated with ASA and ascorbic acid, (2) demonstrated an untoward effect of these drugs on in vivo hyperoxic exposure, (3) illustrate predictive use of in vitro H2O2 lysis for in vivo toxicity, and (4) suggest that some commonly ingested drugs could be detrimental to humans exposed to significant hyperoxia. (Author)

A71-26127 Aeromedical and human factors aspects of airports. *Aerospace Medicine,* vol. 42, Apr. 1971, p. 439-448. 9 refs.

Thirty-four of the world's major civil airports were assessed for the years 1968-1973 with respect to the following areas: (1) airport population, (2) airport medical facilities, (3) airport medical experiences, (4) aircraft accident victims treated in the past decade, (5) comments on certain problems in providing acute and preventive medical services at airports, (6) specific airport design features which have a bearing on medical factors, (7) selected specific human factors considerations, (8) future plans and requirements concerning jumbo jets, SST's, air buses, air taxi aircraft, V/STOL and other types, and (9) comments on criteria for an 'Airport Medical Design Guide.' Detailed information on each of the above areas for these airports was obtained in a prescribed format. The findings are quite revealing to aviation medicine specialists, airport operators, the aviation industry and to all who have a responsibility and interest in air travel efficiency and safety. Shortcomings of existing facilities are pinpointed and recommendations are made to assure that future civil airport operations can be accomplished with efficiency and safety from the medical standpoint. (Author)

A71-26128 Disaster planning at major airports. Georges P. Bergot (Paris Airport Authority, Paris, France). *Aerospace Medicine,* vol. 42, Apr. 1971, p. 449-455. 18 refs.

According to traffic and aircraft capacity development, the Paris Airport Medical Department presents a general survey. The main points are: (1) probability for the number of wounded; statistics show that, in nine cases out of ten, the number of wounded is less than 35% of the number of occupants; a critical medical plane must be chosen according to the airport (B 747 for the majority of major airports); hence it seems to be rational to be equipped for the treatment of at least 140 wounded; (2) medical doctrine should be not to evacuate personnel randomly but to provide means for sorting, on the spot first-aid, mainly for the seriously wounded and then dispatch and transportation; (3) in practice, we have to maintain the internal means necessary for individual cases which are so frequent in cities that are major airports, to use them as a permanent core for first-aid in disasters and to reinforce them if necessary by external means; in this way an efficient adaptable organization can be realized under united control. (Author)

A71-26129 Epidemiological aspects of airport medicine. J. G. Constantino. *Aerospace Medicine,* vol. 42, Apr. 1971, p. 456-460. 7 refs.

Recommendations for improving current efforts in preventing the spread of disease through air-transport facilities. Listed responsibilities of public health authorities and of private physicians include (1) the dissemination of relevant information to travelers, (2) improvement of diagnostic and treatment skills for recognized potential disease threats, (3) enforcement of rules for reporting outbreaks, and (4) increased surveillance of underdeveloped countries which harbor sources of disease. Immunization and chemoprophylaxis procedures are considered, together with the disinfection of aircraft and airport facilities. Control measures are cited for reducing the rising threat of diseases transmitted from cargo animals to passengers. T.M.

A71-26130 • Improved waist seal design for use with lower body negative pressure (LBNP) devices. Roger A. Wolthuis, Joseph T. Baker (Technology, Inc., Dayton, Ohio), and G. W. Hoffler (NASA, Manned Spacecraft Center, Biomedical Laboratories Div., Houston, Tex.). *Aerospace Medicine,* vol. 42, Apr. 1971, p. 461, 462. Contract No. NAS 9-7675.

A new waist seal design is described which permits placement of the seal at a discrete anatomical level, provides for adequate subject comfort, allows ease of ingress and egress and accommodates a wide range of subject waist sizes. Details of the design are provided through the use of appropriate photographs. (Author)

A71-26146 • # Germination and growth of Neurospora at low water activities. Gisela Wohlrab Charlang and N. H. Horowitz (California Institute of Technology, Pasadena, Calif.). *National Academy of Sciences, Proceedings,* vol. 68, Feb. 1971, p. 260-262. 7 refs. Grant No. NGR-05-002-121.

When the water activity of the medium is lowered by the addition of NaCl or nonelectrolytes, an inhibition of germination, growth rate, and total growth is observed in Neurospora crassa. Inhibition of conidial germination is separable from the other effects and is caused, in large measure, by the loss from conidia in media of low water activity of a substance that is essential for their germination. The substance is detectable in the medium and is also extractable from cultures. It is dialysable and thermostable, and it appears to be highly active. It is not detectable in complete medium. (Author)

A71-26189 Mechanical impedance of a mastoid (Zur mechanischen Impedanz des Mastoids). H.-G. Diestel and K. Brinkmann (Physikalisch-Technische Bundesanstalt, Braunschweig, West Germany). *Messtechnik,* vol. 79, Feb. 1971, p. 49-59. 12 refs. In German.

The mechanical impedance of an artificial mastoid, developed for calibrating bone vibrators, was measured as a function of frequency. The results are compared with those obtained for a human mastoid. It was found that the mechanical impedance of the artificial mastoid agrees within 2 dB with the average impedance of a natural mastoid at frequencies up to 3000 Hz. Z.W.

A71-26292 Changes in heart beat phase frequency after acoustic stimulation during the natural sleep of humans (Phasische Herzfrequenzänderungen nach Schallreizen im natürlichen Schlaf des Menschen). W. Baust and J. Marbaise (Düsseldorf, Universität, Düsseldorf, West Germany). *Pflügers Archiv,* vol. 324, no. 2, 1971, p. 165-175. 18 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

EEG, EKG, EMG of musculus hypoglossus, and eye motions were recorded during night sleep in a group of 16 healthy males and females. The heart beat rates of the subjects were accelerated and then slowed down after clicks of 80 db were produced by a loud-speaker 2 m away from their heads. The activity of the vegetative nervous system during the diphasic heart rhythm reaction is discussed. V.Z.

A71-26318 **Discovery of Pre-tertiary fossils indigenous to the Lower Himalayan Basin.** A. M. Patwardhan and A. D. Ahluwalia (Panjab University, Chandigarh, India). *Nature,* vol. 230, Apr. 16, 1971, p. 451, 452. 14 refs.

Invertebrate fossil remnants and microcoprolites were found for the first time in the pelletal phosphorite within the sequence of limestone-black shale-chert, exposed around Mussoorie, Lower Himalayas. This discovery suggests that there is no need to postulate a physical barrier between the Tibetan and the Lower Himalayan Basins in the Pre-tertiary era. Z.W.

A71-26319 **Effect of activated charcoal in agar on the culture of lower plants.** Berthold Klein and Martin Bopp (Heidelberg, Universität, Heidelberg, West Germany). *Nature,* vol. 230, Apr. 16, 1971, p. 474.

The moss, Funaria hygrometrica, was grown on an artificial substrate based on agar that was supplemented with various concentrations of activated charcoal, 4% MnO2, or soil. On the charcoal-agar substrate, a series of characteristic alterations was observed, including limited development of protonema, acceleration of bud formation, and the absence of spreading caulomena on the agar surface. It is supposed that activated charcoal adsorbs substances which influence the development of the protonema. Z.W.

A71-26321 **Experimental biology of extreme environments and its significance for space bioscience. III.** S. M. Siegel (Hawaii, University, Honolulu, Hawaii). *Spaceflight,* vol. 13, May 1971, p. 183-186, 192.

Discussion of mechanisms and conditions for the existence of life forms at extreme temperatures. It is pointed out that organisms can live in aqueous media so modified that the conventional properties of ordinary waters are no longer very meaningful or manifest. Further some life forms may remain operational in essentially nonaqueous media including the often discussed liquid ammonia. These media offer possibilities for the extension of active life process in the range of 233 K, and individual biochemical processes may continue at appreciable rates down to approximately 233 K. Given suitable pressure conditions, an upper limit of no less than 377 K can be accepted for the present. While the upper limits have yet to reach the range of Venus, there can be no questions about extension of lower limits beyond those assigned to Mars to include the giant outer planets. M.M.

A71-26354 # **Temperature regulation during continuous and intermittent exercise in man.** Björn Ekblom, Carol J. Greenleaf, John E. Greenleaf, and Lars Hermansen (Gymnastik- och Idrottshögskolan, Stockholm, Sweden). *Acta Physiologica Scandinavica,* vol. 81, Jan. 1971, p. 1-10. 30 refs. Research supported by the Tri-Centennial Fund of the Bank of Sweden, the Swedish Sport Federation, and the Swedish Delegation for Medical Defence Research.

Body temperature changes and heat dissipation responses were studied in three well-trained men during moderately heavy continuous and intermittent exercise at the same average metabolic rate and heat production. The purpose was to determine if hypothetical 'work factors' induced specifically by muscular activity influenced body temperature regulation. Compared with continuous work, it was found that: (1) the equilibrium level of rectal temperature during intermittent work was elevated 0.35 C which accounted for 21% of the total rectal temperature increase from resting; and (2) the decreased sweating during intermittent work resulted in a decreased evaporative heat loss that could account for the increased intermittent work rectal temperature. These responses appear to be manifestations of reduced thermoregulatory efficiency due, perhaps, to nonlinearity in the relationship of body temperature to total work rate or to nonlinearity in the contribution of nonthermal inputs at work rates above 100% of maximal O2 uptake. M.M.

A71-26355 # **The diurnal rhythm of adrenaline secretion in subjects with different working habits.** Paula Pátkai (Stockholm, Universitet, Stockholm, Sweden). *Acta Physiologica Scandinavica,* vol. 81, Jan. 1971, p. 30-34. 9 refs. Research supported by the Swedish Council for Social Science Research, the University of Stockholm, and the Swedish Medical Research Council.

Subjects classified as habitual morning vs evening workers on the basis of their answers to a questionnaire, were compared with regard to catecholamine excretion under conditions of relaxation in the morning and in the evening. It was shown that individuals who preferred to work in the evening excreted more adrenaline in the evening than in the morning, while individuals characterized by morning alertness excreted more adrenaline in the morning than in the evening, also when relaxing. With regard to noradrenaline excretion there was no marked difference between the groups. (Author)

A71-26356 # **Interindividual differences in diurnal variations in alertness, performance, and adrenaline excretion.** Paula Pátkai (Stockholm, Universitet, Stockholm, Sweden). *Acta Physiologica Scandinavica,* vol. 81, Jan. 1971, p. 35-46. 21 refs. Research supported by the Swedish Council for Social Science Research, the University of Stockholm, and the Swedish Medical Research Council.

Subjects classified as habitual morning vs evening workers on the basis of their answers to a questionnaire were compared with regard to day-time variation in catecholamine excretion and performance. Adrenaline excretion in morning workers was highest in the morning and decreased gradually during the day, while evening workers showed nearly constant excretion values. The performance of morning workers did not vary during the day, while evening workers showed a steady improvement, performing best in the evening. In addition, a significant difference between the two groups was found in the personality dimension of extroversion-introversion, showing that evening workers were more extrovert and morning workers more introvert. The constancy of individual diurnal rhythms and their relations to personality traits are discussed. (Author)

A71-26357 # **Transient dynamics of ventilation and heart rate with step changes in work load from different load levels.** Svetlana Broman and O. Wigertz (Kungl. Karolinska Institutet, Stockholm, Sweden). *Acta Physiologica Scandinavica,* vol. 81, Jan. 1971, p. 54-74. 31 refs. Research supported by the Swedish Medical Research Council.

This analysis was performed in six male athletes performing submaximal cycling exercise in the supine position, with the steps initiated at different levels of stable-state exercise, including 'load-less' pedaling. By applying mathematical parameter identification, the responses of transient dynamics of ventilation (V) to both positive and negative step changes in work load could be accurately described by first-order exponential models. With the positive steps initiated at 0, 300, and 650 kpm/min, the means of the time constant estimates for V ranged from 67 to 101 sec, and seemed to be independent of the initial work level. The responses of heart rate (HR) required second-order models, with the two time constants ranging from 9.0 to 11.7 sec and from 1.8 to 3.7 min, and with the share of the slower component increasing with the initial work level. The results support the notion that in exercise the respiratory and circulatory control systems exhibit dissociated dynamic properties. M.M.

A71-26358 # **Blood flow in the calf muscle of man during heavy rhythmic exercise.** Björn Folkow, Ulf Haglund, Mats Jodal, and Ove Lundgren (Göteborg, Universitet, Göteborg, Sweden). *Acta Physiologica Scandinavica,* vol. 81, Feb. 1971, p. 157-163. 6 refs. Research supported by the Universitet Göteborg; Swedish Medical Research Council; PHS Grant No. HE-05675-09.

Investigation of the effect of leg position on blood flow in the calf muscles of man during heavy rhythmic exercise, since vascular transmural pressure is markedly increased in the upright position. It was found that calf muscle blood flow in man is markedly increased during standardized heavy rhythmic exercise when the subject is tilted from the supine to the 'leg-down' position. F.R.L.

A71-26359 # **Ventilation and heart-rate responses to ramp-function changes in work load.** H. Karlsson and O. Wigertz (Kungl. Karolinska Institutet, Stockholm, Sweden). *Acta Physiologica Scandinavica*, vol. 81, Feb. 1971, p. 215-224. 8 refs. Research supported by the Swedish Medical Research Council and the Swedish Board for Technical Development.

Exploration of the suitability of ramp changes in work load for studying the dynamics of the ventilation and heart-rate response to exercise and the possible influences on these responses of alterations in the slope of the work-load ramp. Results from stable-state measurements, which are tabulated, indicate that the systems underlying the ventilatory and heart-rate responses may be regarded as reasonably linear. In this respect the present results are comparable to those previously obtained with sine-wave and step testing. F.R.L.

A71-26360 # **Changes in the electrochemical potential difference for HCO3(-) between blood and cerebrospinal fluid and in cerebrospinal fluid lactate concentration during isocarbic hypoxia.** A. H. Mines and S. C. Sørensen (California, University, San Francisco, Calif.). *Acta Physiologica Scandinavica*, vol. 81, Feb. 1971, p. 225-233. 21 refs. NIH Grants No. HE-06285; No. GM-09262.

Study of the changes in cerebrospinal fluid (csf) /HCO3(-)/ and /lactate/ in dogs whose arterial pH, P-carbon dioxide, and /HCO3(-)/ were kept constant during 6-hr hypoxia or normoxia. Experimental results are considered to confirm that an increased anaerobic glycolysis in the brain is responsible for titrating HCO3(-) out of csf during isocarbic hypoxia, although the lactate concentration in csf increases only about one third as much as the /HCO3(-)/ decreased. F.R.L.

A71-26361 # **The effect of iso-carbic metabolic acidosis in blood on /H(+)/ and /HCO3(-)/ in csf with deductions about the regulation of an active transport of H(+)/HCO3(-) between blood and csf.** A. H. Mines, C. G. Morril, and S. C. Sørensen (California, University, San Francisco, Calif.). *Acta Physiologica Scandinavica*, vol. 81, Feb. 1971, p. 234-245. 24 refs. NIH Grants No. HE-06285; No. GM-09262.

Comparison of the changes in pH and /HCO3(-)/ in the csf of anesthetized, paralyzed dogs during metabolic acidosis with those changes when the blood acid-base parameters were kept at a normal level. Arterial and csf P-carbon dioxide were kept constant at the same level during both kinds of experiments. It is concluded that the rate of active transport of H(+)/HCO3(-) between blood and csf is affected by changes in plasma /HCO3(-)/. This mechanism provides pH stability in the brain environment during metabolic blood acid-base changes, whereas the effect is opposite during respiratory acid-base changes. F.R.L.

A71-26362 # **Whole-blood viscosity, hematocrit and plasma protein in normal subjects at different ages.** J. Ditzel and J. Kampmann (Aalborg Regional Hospital, Aalborg, Denmark). *Acta Physiologica Scandinavica*, vol. 81, Feb. 1971, p. 264-268. 10 refs.

Measurement of whole-blood viscosity at six fixed shear rates with a cone-plate viscometer. Ninety healthy subjects, evenly divided as to sex in three age groups from 15 to 80 years, were selected by these criteria: normal hematocrit, erythrocyte sedimentation rate, serum creatinine concentration, and degree of intravascular erythrocyte aggregation evaluated by conjunctival biomicroscopy; and freedom from disease affecting known rheological properties of the blood. A stepwise regression analysis of rheological factors and whole-blood viscosity showed that the hematocrit had by far the closest relation to the whole-blood viscosity at all shear rates. F.R.L.

A71-26363 # **The effect of high oxygen tensions on ventilation during severe exercise.** S. Kozlowski, B. Rasmussen, and W. G. Wilkoff (Copenhagen, University, Copenhagen, Denmark). *Acta Physiologica Scandinavica*, vol. 81, Mar. 1971, p. 385-395. 15 refs.

The investigation was conducted in order to determine whether the change in ventilation is of humoral or of nervous origin (from chemoreceptors) or a combination of both. Accordingly, the time course of ventilation was determined in the transient from low to high oxygen tensions and from high to low oxygen tension. Blood samples taken during the transient were analyzed for partial pressure of carbon dioxide, pH and lactate concentration. The full depressant effect on the ventilation of high oxygen tensions was obtained after 10 to 20 seconds, independent of the oxygen tension before the transient. When the subjects went from high oxygen tension to a lower oxygen tension the ventilation became stable after 30 to 40 seconds. The ventilation came back to values a little higher than the control values. G.R.

A71-26378 **Bispectrum analysis of electroencephalogram signals during waking and sleeping.** T. P. Barnett (Westinghouse Electric Corp., Annapolis, Md.), L. C. Johnson, P. Naitoh, C. Nute (U.S. Navy, Medical Neuropsychiatric Research Unit, San Diego, Calif.), and N. Hicks (Westinghouse Ocean Research Laboratory, San Diego, Calif.). *Science*, vol. 172, Apr. 23, 1971, p. 401, 402. 13 refs. Research supported by the Westinghouse Electric Corp. and the U.S. Navy; NSF Grant No. GB-14829.

The degree of interaction of component waves making up a single EEG trace was found to be strongly correlated with alpha activity, lead placement, and state of consciousness. Significant quadratic coupling of the waves was found only for awake subjects with high alpha activity. For these subjects, about 50% of beta activity can be attributed to harmonic coupling with the alpha peak. During sleep, the degree of interaction was of borderline significance and did not follow a consistent pattern with respect to subject, frequency, state, or lead. Z.W.

A71-26408 **Temperature, skeletal muscle mitochondrial functions, and oxygen debt.** George A. Brooks, Karl J. Hittelman, John A. Faulkner, and Robert E. Beyer (Michigan, University, Ann Arbor, Mich.). *American Journal of Physiology*, vol. 220, Apr. 1971, p. 1053-1059. 36 refs. Research supported by the Western Electric Co.; NIH Grant No. AM-10056-05; NSF Grant No. GB-13496.

Measurement of the O2 consumption of isolated rat skeletal muscle mitochondria at temperatures between 25 and 45 C in vitro in order to determine the relationship between temperature and respiration. Increasing temperature had a striking effect on mitochondrial functions. It was found that, due to the increase in nonconservative respiration and decrease in phosphorylative efficiency, a portion of the postexercise O2 consumption is not associated with recovery from anaerobic metabolism. The classical definition of O2 debt, therefore, requires revision. Furthermore, observed decreases in energy conserving efficiency at elevated temperatures suggest a molecular mechanism for muscle fatigue under conditions of exercise induced hyperthermia. M.M.

A71-26428 **Comparison of the vectorcardiogram with the electrocardiogram in the prediction of left ventricular size.** Donald L. Vine, R. Newell Finchum, Harold T. Dodge, William H. Bancroft, Jr., and David C. Hurst (Alabama, University; U.S. Veterans Administration Hospital, Birmingham, Ala.). *Circulation*, vol. 43, Apr. 1971, p. 547-558. 39 refs. Research supported by the U.S. Department of Health, Education and Welfare and the Alabama State Vocational Rehabilitation Service; PHS Grant No. HE-05737.

In 107 patients, precordial QRS voltage measurements were compared with vectorcardiographic spatial magnitude measurements in their relationship to angiocardiographically determined left ventricular mass and volume. Sensitivity, specificity, and linear correlations obtained with instantaneous spatial QRS magnitude measurements were similar to those obtained with selected precordial voltage measurements suggested by Sokolow et al. (1949) and Grant (1957). Multiple regression analysis was employed in an attempt to improve the correlation between electromotive measurements and left ventricular size. The results do not support a large practical advantage for the vectorcardiogram over the electrocardiogram in the prediction of left ventricular size. Z.W.

A71-26484 **Chorioretinal temperature increases from solar observation.** T. J. White, M. A. Mainster, P. W. Wilson, and J. H. Tips (Technology, Inc., San Antonio, Tex.). *Bulletin of Mathematical Biophysics,* vol. 33, Mar. 1971, p. 1-17. 21 refs. Contracts No. AF 41(609)-70-C-0007; No. DASA-01-69-C-0121.

Chorioretinal temperature increases produced by solar observations are computed digitally. The spectral characteristics of solar radiation and the spectral transmittances of the atmosphere, atmospheric water vapor and ocular media are considered. Image spread is employed in all calculations. The calculations are executed for a variety of observation angles, and the effects of pupil diameter, fixed filters and optical instruments are predicted. Temperature increases are also computed for solar eclipse observations by the appropriate superposition of unobscured solar disk solutions. (Author)

A71-26485 **An integral method for the analysis of blood flow.** F. K. Tsou, P. C. Chou, A. W. Hahn (Drexel University, Philadelphia, Pa.), and S. N. Frankel. *Bulletin of Mathematical Biophysics,* vol. 33, Mar. 1971, p. 117-128. 9 refs. PHS Grant No. HE-5417.

The existing methods to solve the problems of pulsatile flow in the cardiovascular system are based on either linear axisymmetric equations or nonlinear one-dimensional equations. The solutions thus obtained give only a mediocre comparison with measurements. In this paper, a nonlinear axisymmetric theory is proposed. The starting point of the present theory is a third degree polynomial representation of the velocity profile. Integral methods are then applied to obtain the governing equations. To ascertain the accuracy of the theory proposed above, the calculations for a simple case involving pulsatile flow in a long rigid tube were performed. The results are: (1) the average velocities compare very well with exact solutions and (2) the velocity profiles for a given frequency agree very well with exact solutions for flow in small tubes, but tend to differ as tube size is increased. (Author)

A71-26509 # **Recent research into the effect of low level carbon monoxide exposure on psychomotor performance in healthy humans.** Robert D. O'Donnell (USAF, Washington, D.C.). In: Institute of Environmental Sciences, Annual Technical Meeting and Equipment Exposition, 17th, Los Angeles, Calif., April 26-30, 1971, Proceedings. Mt. Prospect, Ill., Institute of Environmental Sciences, 1971, p. 266-269. 23 refs.

Assessment of safe-limit levels of carbon-monoxide exposure devoid of behavioral toxicity in terms of human psychomotor performance. The methods used and results obtained in recent investigations aimed at such assessments are reviewed. It is felt that there is no reason to believe that psychomotor performance will be degraded in healthy humans by exposure for up to 8 hours at 50 ppm of CO when there is no CO interaction with other contaminants. Earlier results indicating behavioral toxicity of CO acting alone at these levels have not been confirmed. The need is pointed out of directing future research at clarifying the basic mechanisms of CO effects and, in particular, of CO interaction with other pollutants of the environment. M.V.E.

A71-26510 # **Awakening effects of aircraft noise and sonic booms on sleep.** Jerome S. Lukas (Stanford Research Institute, Menlo Park, Calif.). In: Institute of Environmental Sciences, Annual Technical Meeting and Equipment Exposition, 17th, Los Angeles, Calif., April 26-30, 1971, Proceedings. Mt. Prospect, Ill., Institute of Environmental Sciences, 1971, p. 282-286. 8 refs.

The effects of subsonic jet aircraft noise and simulated sonic booms on the sleep of six people in each of three age groups (5 to 8 years, 41 to 57 years, and 69 to 75 years) were studied over some 20 nonconsecutive nights for each subject. Two subject variables, age and relative sensitivity, and a single stimulus variable, intensity, were identified as affecting the responses of humans to those noises during sleep most significantly. (Author)

A71-26511 # **Non-auditory and auditory health effects of noise exposure.** Aram Glorig (Callier Hearing and Speech Center, Dallas, Tex.). In: Institute of Environmental Sciences, Annual Technical Meeting and Equipment Exposition, 17th, Los Angeles, Calif., April 26-30, 1971, Proceedings. Mt. Prospect, Ill., Institute of Environmental Sciences, 1971, p. 287-292. 7 refs.

Discussion of the nature and the temporary or permanent character of the physiological effects of noise. The principles of hearing conservation in noise are presented with a brief review of noise measurement and amount of risk involved with various noise-exposure levels in dB(A). It is felt that for hearing conservation purposes noise measurement in dB(A) is adequate, and that time relations can be approximated by the 5 dB rule. It is concluded that differential diagnosis of noise-induced hearing loss requires detailed information particularly with respect to occupational history. M.V.E.

A71-26534 # **Engineering for the lunar environment.** R. B. Carpenter, Jr., J. M. Mansfield, and D. J. Stone (North American Rockwell Corp., Space Div., Downey, Calif.). In: Engineering for the space environment; American Society of Civil Engineers and American Institute of Aeronautics and Astronautics, Specialty Conference, Houston, Tex., April 15-17, 1970, Proceedings. New York, American Society of Civil Engineers, 1970, p. 163-185. 15 refs.

Various techniques for advanced lunar exploration have been investigated by NASA and others. Common to all of these investigations is the requirement for long surface staytimes. This paper discusses some of the methods for meeting this requirement and the influence of the lunar-surface environment upon various subsystem approaches. Techniques described include use of indigenous lunar material as a shield against radiation and use of a deployable conical shield for protection against thermal extremes and meteoroids. Also discussed are the large amounts of water needed for space-suit cooling during extravehicular activity and the influence of this water requirement upon the selection of the power supply and environmental control subsystems. Additional issues discussed include the removal of carbon dioxide from the shelter atmosphere and the equalization of pressure during crew egress and ingress. For the carbon dioxide removal function, systems using expendable chemicals appear to be the most advantageous for missions of the near future. In more advanced missions, system weight and power requirements could be significantly reduced if solar heating and vacuum were used to desorb the zeolite and dessicant beds of a molecular sieve. For pressure equalization, an expandable-tank concept for temporary storage of the atmosphere during extravehicular activity appears well suited to the lunar-surface operations. (Author)

A71-26613 **Surface lightness and cues for the illumination.** Jacob Beck (Oregon, University, Eugene, Ore.). *American Journal of Psychology,* vol. 84, Mar. 1971, p. 1-11. 15 refs. NSF Grant No. GB-8027.

Investigation of the effects due to contrast and those due to cues for illumination on the perception of surface lightness. Observers who judged the lightness of two equally illuminated targets, only one of which cast a shadow on a background, perceived the target that cast the shadow as darker than the other target. This result confirms earlier findings that the perception of surface lightness may be affected by cues for the conditions of illumination as well as by the inhibitory interactions underlying contrast. The hypothesis is that such cues affect the perception of lightness by creating the impression of 'special' illumination. M.V.E.

A71-26641 # **Biological action of space flight factors on lysogenic bacteria E. coli K-12(lambda) and human cells in a culture (O biologicheskom deistvii faktorov kosmicheskogo poleta na lizogennye bakterii E. coli K-12/lambda/ i kletki cheloveka v kul'ture).** N. N. Zhukov-Verezhnikov, M. N. Volkov, N. I. Rybakov, I. N. Maiskii, P. P. Saksonov, M. A. Guberniev, I. I. Podoplelov, V. V. Antipov, V. A. Kozlov, A. N. Kulagin, E. D. Aniskin, K. D.

Rybakova, N. I. Sharyi, Z. P. Voronkova, G. P. Parfenov, V. I. Orlovskii, and V. A. Gumeniuk. *Kosmicheskie Issledovaniia*, vol. 9, Mar.-Apr. 1971, p. 292-299. 25 refs. In Russian.

Study of the effect of space flight factors on lysogenic bacteria E. coli K-12(lambda), the colicinogenic strain E. coli CA-23 (D), and E. coli 200 PS with F-Lac(+) episome, as well as on cultures of Hela, A-1, fibroblast, and Cave K-10 cells. It is shown that under space flight conditions of a certain duration bacteriophage induction and a decrease in the proportion of cells carrying the F-Lac(+) factor in the integrated state are observed. Space flight factors were found to have no effect on the frequency of auxotrophic mutations and the enzyme synthesis of beta-galactosidase induced by isopropyl-beta, D-galactoside in the bacteria. After being exposed four times in space the cultures of Hela cells were found to show changes in the morphology of the cells and in the nature of their growth, and also an intensification of the proliferative activity and antigenic properties. The possible mechanisms of the biological action of space flight factors are discussed. A.B.K.

A71-26651 # **Serotonin and its role in the activity of the central nervous system (Serotonin i ego rol' v deiatel'nosti tsentral'noi nervnoi sistemy).** E. A. Gromova (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 1, July-Sept. 1970, p. 25-50. 201 refs. In Russian.

Generalization of the literature data and the author's own experimental findings regarding the role of serotonin in the activity of the central nervous system. The question of the autonomy of the biosynthesis of serotonin in the brain and the permeability of the hematoencephalic barrier with respect to serotonin is considered, as well as the existence of a special monoaminergic brain system and the presence of a neuronal system in the brain controlling the monoamine metabolism in the brain cortex. Considerable attention is given to the question of the role of serotonin in regulating the sleep/wakefulness cycle. Data concerning the relation between serotonin and learning processes are presented. On the basis of an analysis of the results of studies of the microionophoretic action of serotonin on the neurons of various parts of the central nervous system, the question of the mediator function of serotonin and its interrelations with other nerve excitation mediators is discussed. A.B.K.

A71-26652 # **Importance of histamine in the activity of the nervous system (Znachenie gistamina dlia deiatel'nosti nervnoi sistemy).** I. L. Vaisfel'd (Akademiia Nauk SSSR, Laboratoriia Problem Upravleniia Funktsiiami v Organizme Cheloveka i Zhivotnykh, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 1, July-Sept. 1970, p. 51-69. 135 refs. In Russian.

Systematization of the literature data and the author's own findings regarding the localization of histamine and the enzyme systems participating in its biosynthesis and decomposition in the tissues of the nervous system of animals and humans under normal conditions and in various physiological and pathological states. A comparative analysis is made of the interrelations between histamine and other biogenic amines (serotonin, noradrenalin, and acetylcholine). The question of the participation of histamine in synaptic mediation and reception processes is discussed. The pharmacological action of histamine in treating diseases of the central and peripheral nervous system is stressed. A.B.K.

A71-26653 # **Dynamics of increasing the resistance of an organism and its adaptive reactions at the cellular level in the course of adaptation to hypoxia (Dinamika povysheniia rezistentnosti organizma i adaptivnykh reaktsii na kletochnom urovne v protsesse adaptatsii k gipoksii).** Z. I. Barbashova (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 1, July-Sept. 1970, p. 70-88. 91 refs. In Russian.

Study of the relation between the dynamics of increasing the resistance of an organism to hypoxia and the adaptive reactions occurring in various tissues during the course of adaptation to hypoxia. Analyses were performed at various times during the adaptation of rats to hypoxia at simulated altitudes daily increasing from 2500 to 7000-7600 m. It is found that the resistance of the entire organism becomes considerably greater than in the control around the twentieth to thirtieth day of adaptation. Within this same period of time an increase in the glycolysis rate and in the activity of certain glycolytic enzymes is observed in the brain tissues, myocardium, and skeletal muscles, as well as a change in the isoenzyme spectrum of lactate dehydrogenase. In the oxidation metabolism, at the same time, an increase in the mitochondrial protein per unit weight of heart muscle and an increase in the rate of phosphorylation in the heart mitochondria are noted. As a result of these changes the oxygen consumption by the myocardium (from a medium with a low oxygen partial pressure) is found to be higher than in the control. The myoglobin concentration in the skeletal and heart muscles is increased, and qualitative changes in the erythrocytes are observed, the latter acquiring certain traits characteristic of erythrocytes in early states of ontogenesis. A.B.K.

A71-26654 # **Diffusing capacity of the lungs (Diffuzionnaia sposobnost' legkikh).** R. S. Vinitskaia and A. A. Markosian (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 1, July-Sept. 1970, p. 89-99. 29 refs. In Russian.

Evaluation of methods of studying the diffusing capacity of human lungs. The main methods involving the use of carbon monoxide are described. Particular attention is given to a method of dividing the diffusing capacity of the lungs into its components: diffusion through the alveolar-capillary membrane and diffusion into the blood of the lung capillaries. The effect of anthropometric factors, the physical load, nonuniformity of ventilation, and nonuniformity of perfusion on the diffusing capacity of the lungs is discussed. Data concerning disturbances on the diffusing capacity of the lungs during various pathological states are presented. A.B.K.

A71-26705 Function of the ventral spinocerebellar tract - A new hypothesis. A. Lundberg (Göteborg, Universitet, Göteborg, Sweden). *Experimental Brain Research*, vol. 12, no. 3, 1971, p. 317-330. 47 refs. Research supported by the Swedish Medical Research Council.

The hypothesis is proposed that some ventral spinocerebellar tract (VSCT) cells monitor transmission in inhibitory pathways to motoneurons by measuring the output from last order inhibitory interneurons against the excitatory input to them. It is suggested that some of the VSCT cells also receive collateral connections from inhibitory interneurons of reflex pathways. It is also assumed that other VSCT cells compare collateral effects from excitatory and inhibitory pathways converging onto motoneurons. The function of the VSCT is discussed in relation to the integration occurring at an interneuronal level in spinal reflex pathways. It is suggested that the descending control of inhibitory reflex pathways requires feedback information regarding transmission in these pathways and that this information is supplied by the VSCT. O.H.

A71-26758 # **Cleanliness requirements for space borne optical sensors.** D. C. Smith (Hughes Aircraft Co., Culver City, Calif.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 6th, Tullahoma, Tenn., Apr. 26-28, 1971, Paper 71-471.* 21 p. 16 refs. Members, $1.50; nonmembers, $2.00.

The size distribution, shape, population densities, chemical compositions, and origin of particles constituting a major threat to spacecraft-borne optical sensors are discussed, and contamination tolerances and control techniques are reviewed. Cleanliness requirements for internal and external spacecraft surfaces, as well as for parts used in hydraulic systems, are established. Cleanroom problems posed by the prevention of airborne dirt accumulation on hardware surfaces during assembly are examined. Procedures for cleanliness control during environmental testing and during launch operation are outlined, and cleanliness level predictability assessed. The desirability is mentioned of spacecraft design permitting solvent flushing of all exterior surfaces as part of the final cleaning process. M.V.E.

A71-26769 **Physiology of color and pattern vision.** Koiti Motokawa (Tohoku University, Sendai, Japan). Tokyo, Igaku Shoin, Ltd.; Berlin, Springer-Verlag, 1970. 287 p. 479 refs. $18.

A survey is presented of the physiology and psychophysics of vision based substantially on experimental studies performed with the aid of a method of systematic study of the retina using a new technique of retinal electrical stimulation. The electrical characteristics of the retina, the visual pathway, and the central mechanisms of pattern vision are introduced, along with the retinal color processes. The wave nature of retinal induction and the electrical excitation of the eye with characteristic frequencies are discussed, and a theory of color vision is developed. Optical illusion and figural aftereffect are discussed. Special attention is given to movement sensation and stereoscopic vision. Simulation of the visual system is also considered. M.V.E.

A71-26863 **The physics of colour vision.** K. H. Ruddock (Imperial College of Science and Technology, London, England). *Contemporary Physics*, vol. 12, May 1971, p. 229-256. 65 refs.

Investigation of human color vision relies primarily upon psycho-physical methods which require active observer participation in the experiments. The principal results of such experiments are stated and discussed in relation to the functional organization of human color vision. Generally, objective techniques, such as electrophysiology, are employed in the study of color vision responses in non-human vertebrate species. The structural and functional organization of vertebrate color vision as revealed by these objective methods is described and the relationship between objective and psycho-physical results examined. Other sections of the article are concerned with defective color vision and with parametric variations in normal color vision. It is concluded that a reasonably consistent scheme for the organization of human color vision emerges from the various types of experimental investigation, and that this scheme is adequate for the interpretation of a variety of color vision phenomena. (Author)

A71-26868 **Electromagnetic fields and the life environment.** Karel Marha, Jan Musil, and Hana Tuhá (Institute of Industrial Hygiene and Occupational Diseases, Prague, Czechoslovakia). San Francisco, San Francisco Press, Inc., 1971. 142 p. 288 refs. Translation. $6.50.

The primary purpose of this text is to make known to physicians and electronic engineers the fundamental problems encountered in evaluating the possible effects of radio waves on living matter, with particular emphasis on man and the protection of the human organism against such effects. An understanding of basic concepts of mathematics, physics, biology, and chemistry is necessary. The biological effects of electromagnetic waves and their mechanisms; the occurrence and use of electromagnetic energy; the maximum permissible field intensity and radiation and their determination; health and technical problems involved in working with generators of electromagnetic waves; and the organization of working conditions are considered. An appendix describes a standard method of determining field intensity and electromagnetic wave irradiation in the rf and uhf ranges for health purposes. F.R.L.

A71-26937 • **Nonlinear analysis of flow pulses and shock waves in arteries. I.** Max Anliker, Robert L. Rockwell (Stanford University, Stanford, Calif.), and Eric Ogden (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.). *Zeitschrift für angewandte Mathematik und Physik*, vol. 22, Mar. 25, 1971, p. 217-246. 38 refs.

Large-amplitude waves in blood vessels were studied in anesthetized dogs to develop a thorough quantitative understanding of how the various cardiovascular parameters affect the pressure and flow pulses. The principal objective was to find a noninvasive method of determining possible changes which may occur in the cardiovascular system of astronauts as a result of prolonged exposure to weightlessness. A mathematical model of the aorta was developed which can be used to predict actual wavefront velocity with reasonable accuracy. O.H.

A71-26951 # **Selection and training of astronauts (Selekcja i trening astronautów).** Zbigniew Jethon. *Technika Lotnicza i Astronautyczna*, vol. 26, Mar. 1971, p. 2-6. In Polish.

Description of basic requirements posed for candidate astronauts, and survey of important training procedures in qualification programs. Equipment, schedules, and evaluation methods are outlined for acceleration tolerance, hypoxia tolerance, weightlessness tolerance, temperature-variation tolerance, psychological and physical fitness, rescue-operations, theoretical-background, and practical-knowledge training. T.M.

A71-27008 • **Response strategies in a two-choice reaction task with a continuous cost for time.** Richard G. Swensson (Bell Telephone Laboratories, Inc., Holmdel, N.J.) and Ward Edwards (Michigan, University, Ann Arbor, Mich.). *Journal of Experimental Psychology*, vol. 88, Apr. 1971, p. 67-81. 17 refs. USAF-supported research; Grant No. NGR-23-005-171.

Each trial of a two-choice task rewarded correct responses, but charged a cost proportional to the response time. Seven of the eight subjects in three experiments violated predictions of the random-walk model and confirmed those of the fast-guess model by using only two response strategies in all conditions. Stimulus frequency and payoffs primarily determined which strategy a subject would adopt. M.V.E.

A71-27126 **Effects of pressure on ventilation and gas exchange in man.** Herbert A. Saltzman, John V. Salzano, G. Douglas Blenkarn, and Johannes A. Kylstra (Duke University, Durham; North Carolina, University, Chapel Hill, N.C.). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 443-449. 12 refs. NIH Grants No. HE-07896; No. HE-5662; Contracts No. NR-101-758; No. N 00014-67-A-0251-0016.

The investigation was undertaken in order to determine if stratified inhomogeneity would occur under conditions encountered during deep diving. The experimental subjects breathed mixtures of oxygen and nitrogen and/or mixtures of oxygen and helium at 1, 4.02, 7.05, and 8.57 Ata and an oxygen-neon mixture at 7.05 Ata. No significant changes in heart rate or blood pressure occurred with exposure to inspired pressure of helium, neon and nitrogen in excess of 5000 mm Hg. Coefficients of correlation between the environmental parameters and group means of the respiratory variables are presented. G.R.

A71-27127 **Renal oxygenation in male Peruvian natives living permanently at high altitude.** Drummond Rennie, Rodolfo Lozano, Carlos Monge, Francisco Sime, and Jose Whittembury (Presbyterian St. Luke's Hospital, Chicago, Ill.; Universidad Peruana Cayetano Heredia, Lima, Peru). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 450-456. 38 refs. Grant No. DA-DA-17-68-C-8019.

The studies were conducted in order to determine whether the hypoxic environment or the compensatory adjustments to this environment, for example, polycythemia, reduced tubular function as assessed by PAH extraction, and whether there was evidence of renal hypoxia, such as reduced oxygen delivered to and uptake by the kidneys. This was done by catheterizing the renal vein in healthy, acclimatized native volunteers to determine PAH extraction, and therefore renal blood flow, and to measure oxygen uptake by their kidneys. G.R.

A71-27128 **Cardiovascular responses to submaximum and maximum effort cycling and running.** John A. Faulkner, Donald E. Roberts, Robert L. Elk, and James Conway (Michigan, University, Ann Arbor, Mich.). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 457-461. 15 refs. Research supported by the Michigan Heart Association.

The carbon dioxide rebreathing method was used to estimate the cardiac outputs of eight men during selected work loads on a bicycle ergometer and on a motor-driven treadmill. Changes in heart rate (HR), stroke volume, cardiac output, and oxygen parameters

were investigated under conditions of submaximum and maximum work involving times from 5 to 10 min, and at up to 100% of maximum physical work capacity. In submaximum work, HR was significantly higher after 10 min of cycling than after 5 min but no significant difference was observed in any other variable. G.R.

A71-27129 Analysis of multicomponent exponential curves by the Post-Widder's equation. R. Peslin, S. Dawson, and J. Mead (Harvard University, Boston, Mass.). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 462-472. 22 refs. NIH Grant No. GM-12564.

The method introduced in respiratory physiology by Nakamura, et al. (1966) is considered. This method provides a continuous distribution function of time constants in inhomogeneous systems. It is shown that, with the usual accuracy, the experimental curve carries little information pertinent to the shape of the actual distribution function. The inversion procedure itself introduces important systematic errors. Other methods are briefly considered, and it is concluded that the tested procedure does not provide a better model of the actual distribution than the simple graphical analysis. G.R.

A71-27130 # Left ventricular internal diameter and cardiac function during exercise. Howard H. Erickson, Vernon S. Bishop, Merrill B. Kardon, and Lawrence D. Horwitz (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 473-478. 20 refs.

The response of the cardiovascular system to exercise by swimming was studied in nine dogs. Measurements of left ventricular internal diameter, left ventricular pressure, cardiac output, and heart rate were recorded continuously during periods of control, exercise, and recovery. During exercise, end-diastolic pressure increased by 21 mm Hg, end-diastolic diameter increased from 34.3 to 36.6 mm, and stroke diameter from 5.9 to 8.3 mm. The mean heart rate increased from 95 to 262 beats/min and stroke volume from 1.6 to 2.1 ml/kg. G.R.

A71-27131 * Gas exchange when one lung region inspires from another. John B. West (California, University, La Jolla, Calif.). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 479-487. Grant No. NGL-05-009-109.

Pulmonary gas exchange has been studied in computer models containing series inequality of ventilation. It was found that a lung region which inspires gas from an adjacent region ('parasitic lung') usually has a high alveolar PCO2 and a grossly impaired CO2 output. By contrast, its O2 uptake is much less affected, and its respiratory exchange ratio is therefore low. The gas exchange of a whole lung containing a parasitic compartment generally has its CO2 output reduced more than its O2 uptake except when the ventilation-perfusion ratio of the parasitic compartment is very low. In models in which the O2 and CO2 transfer are held constant, increasing series inequality of ventilation causes a rapid rise in arterial PCO2 but a slow fall in mixed venous PO2. The arterial PO2 rises quickly when overall ventilation is increased. When the inspired oxygen is raised, alveolar-arterial PO2 differences are generally small. This behavior differs markedly from that found with parallel inequality and a log normal distribution of ventilation-perfusion ratios. (Author)

A71-27132 Area analysis of pressure-volume hysteresis in mammalian lungs. H. Bachofen (Inselspital, Berne, Switzerland) and J. Hildebrandt (Virginia Mason Research Center, Seattle, Wash.). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 493-497. 13 refs. Research supported by the Tuberculosis and Respiratory Disease Association of King County and the Washington State Heart Association; NIH Grant No. HE-12596-02.

Quasi-static pressure-volume loops were obtained from excised cat, dog, and monkey lungs by slowly filling first with air and then with saline. Loop areas were integrated by planimeter. It was found that area could be related to tidal volume and pressure amplitude. Conditions under which plastoelastic and linear viscoelastic models obey the obtained relation are derived and are shown to be consistent with published data. The hysteresis constant of lung tissue as deduced from fluid-filling experiments was only slightly less than that of air-filled lung, although the pressure amplitude of the tissue component was much smaller. G.R.

A71-27133 * Small signal characteristics of carotid sinus baroreceptors of rabbits. G. N. Franz, A. M. Scher, and C. S. Ito (Washington, University, Seattle, Wash.; West Virginia University, Morgantown, W. Va.). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 527-535. 31 refs. PHS Grants No. HE-1315; No. GM-739; Grant No. NGL-49-001-001.

Mathematical models of the small signal characteristics in the form of transfer functions, differential equations, and a frequency response plot are derived. From experiments in which sinus pressure was either kept constant or varied in a step-wise or sinusoidal fashion it is concluded that the static behavior of single rabbit baroreceptors is characterized by a minimum adapted firing frequency at the pressure threshold, a practically linear operating region, a saturation level, and the absence of a static hysteresis. Dynamic response is characterized by bidirectional rate sensitivity, differential equations involving second-order and higher derivatives of both firing frequency and pressure, and asymmetry of transient response depending on operating level and on size, repetition rate, and shape of the stimulus. G.R.

A71-27134 Time course of heart rate, ventilation, and VO2 during laboratory and field exercise. Michael G. Maksud, Lyle H. Hamilton (Wisconsin, University; Wisconsin, Medical College, Milwaukee, Wis.), and Kenneth D. Coutts. *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 536-539. 14 refs. Research supported by the Wisconsin Heart Association.

The heart rate, minute ventilation, and oxygen uptake were measured during treadmill and track running at speeds of 7, 10, and 12 mph. The subjects were 15 male college students. The heart rate responses were similar during treadmill and track running for each of the three running speeds. In general, the minute ventilation during treadmill and track running was similar to each of the three speeds. At 7 mph there were no significant differences in oxygen uptake between treadmill and track running. At the higher speeds oxygen uptake was generally higher during the track runs than during the treadmill runs. The higher oxygen uptakes during the faster running speeds are thought to reflect increased air resistance and/or more vigorous arm movements. (Author)

A71-27135 Alveolar gas exchanges and cardiovascular functions during breath holding with air. S. K. Hong, Y. C. Lin, D. A. Lally, B. J. R. Yim, N. Kominami, P. W. Hong, and T. O. Moore (Hawaii, University, Honolulu, Hawaii). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 540-547. 33 refs. NSF Grant No. GH-62.

Nine male subjects capable of breath holding (BH) for times from 2 to 4 min were employed in the investigations. The residual volume of each subject was measured by the nitrogen-dilution method of Rahn, et al. (1949), and the resting oxygen consumption was determined by using a 13-liter Collins recording spirometer. During 4 min BH the lung supplied 700 ml of oxygen into the blood while it gained only 160 ml of carbon dioxide from the blood, indicating a significant retention of carbon dioxide in the blood and tissues. Mixed venous oxygen pressure and content approached arterial blood values toward the end of BH. G.R.

A71-27136 Pulse wave velocity in human veins. Jurgen H. Nippa, Raymond H. Alexander, and Roland Folse (Washington, University, Seattle, Wash.). *Journal of Applied Physiology*, vol. 30, Apr. 1971, p. 558-563. 18 refs. PHS Grant No. HE-11712-01A1.

Measurement of the propagation velocity of natural pressure waves within veins of humans with a nondestructive technique is described. The blood flow velocity changes at two sites, a known distance apart, have been monitored with two transcutaneous ultrasonic flow detectors that drive a multichannel chart recorder. By means of a model of the vena cava which permits simultaneous

recording of flow velocities at two different sites, it is shown that the instantaneous blood flow velocity can be used to evaluate pulse wave transmission. The average pulse wave velocity in the inferior vena cava has been obtained for 10 subjects by recording the flow changes in the subclavian and femoral veins and has been found to be 1.15 plus or minus 0.33 m/sec. For nine subjects the average pulse wave velocity in the arm, between the wrist and subclavian vein, has been calculated to be 2.05 plus or minus 0.49 m/sec. Data for these studies are presented. The strong influence of respiration and the Valsalva maneuver on the wave velocity is demonstrated and actual recordings are displayed. (Author)

A71-27137 Magnetorheography - Nonbleeding measurement of blood flow. Osamu Okai (Tokyo Women's Medical College, Tokyo, Japan), T. Togawa (Tokyo Medical and Dental University, Tokyo, Japan), and M. Oshima (Tokyo, University, Tokyo, Japan). *Journal of Applied Physiology,* vol. 30, Apr. 1971, p. 564-566.

This research is an attempt to measure blood flow without injuring the body. When a body is placed in a high magnetic field, the blood flow-induced electromotive force (emf) can be detected with surface electrodes using the same principle as an electromagnetic flowmeter. This blood flow measurement is named magnetorheography (its recording, MRG). The venous flow-induced signal has frequency components sufficiently low to be considerably attenuated relative to the arterial flow signal. To measure arterial flow only, the flow-induced signal was transmitted to an a-c amplifier which is incapable of measurement of very low-frequency components and dc. It is, therefore, derived from the theoretical consideration and experimental results that the greater part of the surface induced emf or MRG is due to the arterial flow and linearly related to its peak-to-peak flow. (Author)

A71-27138 A simple, sensitive multichannel servo system for use as a correcting thermobarometer. W. Donner Denckla (Roche Institute of Molecular Biology, Nutley, N.J.). *Journal of Applied Physiology,* vol. 30, Apr. 1971, p. 567, 568.

A thermobarometer servo system is described which can correct for volume changes of 0.01 ml. It has been adapted for a five-channel closed-circuit respiratory apparatus with a significant improvement in the standard deviation of measurement (3- to 5-fold). The reproducibility and sensitivity of this nulling instrument were largely due to a 'taut-wire' type of suspension employed in the photoelectric transducer assembly. (Author)

A71-27139 Blood pressure measurement with Doppler ultrasonic flowmeter. T. M. Kazamias, M. P. Gander, D. L. Franklin, and J. Ross, Jr. (California, University, La Jolla, Calif.). *Journal of Applied Physiology,* vol. 30, Apr. 1971, p. 585-588. 17 refs. PHS Contract No. PH-43-68-1332.

A transducer was applied to the skin over the radial artery and the Doppler signal was radiotelemetered and recorded together with pressure from a proximal cuff. The pressure at which arterial flow resumed during cuff deflation measured systolic pressure and the cuff pressure at which diastolic flow was sustained measured diastolic pressure. In five patients in clinical hypotension and shock the Doppler ultrasonic flowmeter was shown to be superior to standard sphygmomanometry and to indicate accurately systolic pressure at values as low as 44 mm Hg. It is concluded that the Doppler method provides a sensitive and accurate noninvasive approach for the semicontinuous measurement of systemic arterial pressure. G.R.

A71-27140 Arterial tonometry for the atraumatic measurement of arterial blood pressure. Paul D. Stein and Edward F. Blick (Oklahoma, University; U.S. Veterans Administration Hospital, Oklahoma City, Okla.). *(American Physiological Society, Annual Fall Meeting, Indiana University, Bloomington, Ind., Aug. 30-Sept. 3, 1970.) Journal of Applied Physiology,* vol. 30, Apr. 1971, p. 593-596. Research supported by the U.S. Veterans Administration and the Oklahoma Heart Association.

The noninvasive technique developed is based on the principle that displacement of a mechanical force-sensing device located over a superficial artery can be made to be proportional to blood pressure within the artery. The particular advantage of the method is that instantaneous and transient variations of blood pressure can be observed and the configuration waveforms can be recorded. The method seems potentially suited for the atraumatic measurement of transient effects of drugs or physiological interventions, or for the continuous monitoring of arterial blood pressure during surgery. G.R.

A71-27163 # Changes in the functional state of the organism in military transport aviation personnel (Izmenenie funktsional'nogo sostoianiia organizma u letnogo sostava VTA). K. V. Kurdiaev, V. S. Kompanets, A. S. Kontsov, S. S. Levchuk, and A. I. Ignat'ev. *Voenno-Meditsinskii Zhurnal,* Feb. 1971, p. 59, 60. In Russian.

Forty-two healthy crewmembers ranging from 20 to 39 years of age were examined before and after moderate-duration flights at altitudes between 3000 and 5000 m in order to discover possible changes in the nervous system, cardiovascular system, and blood composition. Tests involving the subject's capacity of switching and spreading his attention showed significant post-flight increases in pattern (number) recognition errors. Additional tests showed reduced critical frequencies for resolution of optical flickering signals. Post-flight pulse pressure decreased, while arterial pressure, diastolic pressure, and cardiac contraction frequency increased. Changes in EKG patterns are characterized, together with changes in blood leukocytes, hemoglobin, lymphocytes, and other constituents. T.M.

A71-27164 # Influence of certain flight factors on the perception of time and of muscular efforts (Vliianie nekotorykh faktorov poleta na vospriiatie vremeni i myshechnykh usilii). V. G. Kuznetsov and V. F. Zhernovkov. *Voenno-Meditsinskii Zhurnal,* Feb. 1971, p. 60-64. In Russian.

In-flight and simulator exposures of pilots to alternating accelerations (0.5 to 1.5 Hz at 0.25 to 0.44 g) and to increased ambient temperatures (38 to 45 C for 4 hr) were used to study possible effects on the perception of time intervals and the estimation of muscular effort. Prior to testing, conditioned reflexes to different time intervals between 3 and 20 sec were worked out in the subjects. Results show that exposures to both the accelerations and elevated temperatures cause statistically significant distortions in the perception of time intervals. Both exposures also disturb responses to control-stick movements and distort estimates of muscular effort required to counteract applied mechanical loads. Changes in cardiac rates, arterial pressure, respiration rates, and in responses to electrical stimulation of the vestibular apparatus are also described. T.M.

A71-27165 # State of the visual analysor during the action of negative accelerations (Sostoianie zritel'nogo analizatora pri deistvii otritsatel'nykh peregruzok). N. T. Drozdova. *Voenno-Meditsinskii Zhurnal,* Feb. 1971, p. 65-67. In Russian.

Changes in the visual contrast sensitivity and in the state of the fundus oculi pattern were observed in subjects exposed to single and repeated, 1 to 3 g, negative accelerations in the pelvis-head axis. All observed effects were reversible, and changes occurring in the visual contrast sensitivity did not significantly affect the visual organs. However, the occurrence of hemorrhage in the conjunctiva is taken as a warning of the possibility of more serious organic damage that can seriously affect the flight readiness of crewmembers. T.M.

A71-27248 A comparison of performance on visual and auditory monitoring tasks. Robert S. Kennedy (U.S. Naval Aerospace Medical Institute, Pensacola, Fla.). *Human Factors,* vol. 13, Apr. 1971, p. 93-97.

Comparison of four forms of a vigilance task administered over four sessions in counter-balanced order to 16 subjects. Three of the forms required auditory monitoring (one, two, or three tones) and one required visual (three lights) monitoring. Visual performance was superior to auditory performance; the auditory performance was a function of the number of channels monitored. Performance did not

change over the four sessions. Among the different scoring methods used, 'per cent correct' had the most common variance. Decrements in performance appeared within ten minutes in the one- and two-channel auditory tasks. An overall downward trend appeared in the three-channel visual task but was less regular. No systematic change in performance was apparent in the three-channel auditory task. Intratask correlations over subjects were high (r greater than 75), while intertask correlations showed only 20% common variance. (Author)

A71-27249 An evaluation of ground-based flight trainers in routine primary flight training. H. Kingsley Povenmire and Stanley N. Roscoe (Illinois, University, Savoy, Ill.). *Human Factors,* vol. 13, Apr. 1971, p. 109-116. Research supported by the Link Foundation.

No particular constraints were placed upon the instructor during the investigation as to how he used the equipment. The specific objectives of the program included an evaluation of the flight instructors' ability to predict success in private pilot training on the basis of students' initial performances in each of two ground trainers as opposed to actual aircraft. The relative value of 11 hours of flight instruction in two different ground trainers was investigated, and an objective scale for checking flight proficiency was developed. There was a significant positive correlation of 0.50 between predictions based on two hours of training in the ground based trainers and actual hours required to pass the flight check. G.R.

A71-27250 # The adult human hand - Some anthropometric and biomechanical considerations. John W. Garrett (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Human Factors,* vol. 13, Apr. 1971, p. 117-131. 10 refs.

Recent studies of the anthropometry and selected biomechanical characteristics of hands are summarized. These include: (1) conventional anthropometry of male and female hands, (2) the anthropometry of the relaxed hand, (3) comparison of certain engineering anthropometric and performance parameters between bare and pressure-gloved hands, and (4) the ability to retain grips on selected handles under high dynamic loads. The utility of these data for human factors engineering is discussed. (Author)

A71-27251 In-flight target reporting - How many is 'a bunch.' Lynn V. Rigby and Alan D. Swain (Sandia Laboratories, Albuquerque, N. Mex.). *Human Factors,* vol. 13, Apr. 1971, p. 177-181. AEC-supported research.

This study defines the quantitative meaning of some common but ambiguous modifiers used in noun phrases. The modifiers were 'couple,' 'few,' 'some,' 'several,' '(object)s,' 'number,' 'bunch,' 'lot,' and 'many.' A total of 117 subjects were asked to make quantitative estimates of each of 45 sighting reports, such as a 'bunch of trucks.' It was found that the mean numerical estimates associated with the above modifiers differed significantly across the modifiers and types of target used in the noun phrases but did not depend on the type of pilot background and aircraft flown. (Author)

A71-27252 A psychophysical evaluation of the accuracy of shape discrimination as an aircraft landing aid. Michael J. Kelly and William D. Bliss (Montana State University, Bozeman, Mont.). *Human Factors,* vol. 13, Apr. 1971, p. 191-193.

Evaluation of the accuracy possible in detecting glide angle by painted diamonds instead of the runway centerline striping. The just-noticeable difference between a square and a diamond shape was determined. This ratio was found to be 1.049/1.00 for the upper just noticeable difference and .945/1.00 for the lower just noticeable difference. This finding indicates that, if discrimination in the real world approaches this accuracy, deviations of approximately .17 deg above or below glide slope are detectable. (Author)

A71-27253 Behavioral analysis of the Cooper Scale. J. F. Murrell (RAF, Institute for Aviation Medicine, Farnborough, Hants., England). *Human Factors,* vol. 13, Apr. 1971, p. 195, 196. 6 refs.

The efficiency of current aircraft handling rating scales is examined. It is shown that there is a discrepancy between the rating scales which are unidimensional and the concept of aircraft handling which is multidimensional. Because of this discrepancy, it is suggested that current aircraft handling rating scales do not have the complexity or capacity to overcome the communication gap in understanding and interpreting pilot opinion. O.H.

A71-27287 Computer analysis of the orthogonal electrocardiogram and vectorcardiogram in 1,002 patients with myocardial infarction. E. E. Eddleman, Jr. and Hubert V. Pipberger (U.S. Veterans Administration Hospital, Washington, D.C.). *American Heart Journal,* vol. 81, May 1971, p. 608-621. 37 refs. PHS Grants No. HE-09696; No. HE-11310.

In 39% of this series, tracings were obtained during the acute phase of myocardial infarction and in 61% at a later date. Using linear discriminant-function analysis with 15 different ECG variables, it was possible to identify correctly 84% of the infarct series with 6% false positives. The results were tested on an independent record sample derived from 240 autopsy cases of myocardial infarcts. The results of the study emphasize the need for efficient control of false positive rates because increases in diagnostic sensitivity are frequently offset by concomitant losses in specificity. Application of multivariate analysis techniques proved very efficient for diagnostic ECG classification by computer. M.M.

A71-27288 Electrocardiographic changes due to cardiac enlargement. Kyozo Ishikawa, Alan S. Berson, and Hubert V. Pipberger (U.S. Veterans Administration Hospital, Washington, D.C.). *American Heart Journal,* vol. 81, May 1971, p. 635-643. 16 refs. PHS Grant No. HE-09696.

In following up 15 patients with congestive heart failure, special effort was directed toward investigating a relationship between cardiac size, estimated from chest X-ray, and corrected orthogonal ECG findings (Frank lead system). In 12 patients, clinical improvement was accompanied by significant increase in QRS voltages represented by the magnitude of the spatial maximal QRS vector, the sum of R wave amplitudes in Leads X and Z, and the magnitude of the maximal QRS vector in the transverse plane. In an additional three patients, symptoms of congestive heart failure increased with a comcomitant increase in heart size. In these patients, QRS voltages decreased. It seems reasonable, therefore, to postulate that these ECG measurements can be used as an indicator of cardiac size and the ciinical course of patients with congestive heart failure. It is most likely, although not enough is known, that intracavitary blood mass might be the cause of these ECG changes. M.M.

A71-27289 * Ectopic right atrial rhythms - Experimental and clinical data. M. Mirowski, Bernard Tabatznik (Sinai Hospital of Baltimore, Inc.; Johns Hopkins University, Baltimore, Md.), S. H. Lau, Andrew L. Wit, Charles Steiner, Gustavus A. Bobb, and Anthony N. Damato (U.S. Public Health Service, Hospital, Staten Island, N.Y.). *American Heart Journal,* vol. 81, May 1971, p. 666-676. 22 refs. NIH Grant No. 5SO-1FR-05478-08; NASA Contract No. T-22416.

In 18 out of 25 canine hearts studied with bipolar plunge electrodes, ectopic right atrial (RA) beats were observed occurring either spontaneously, or during vagal stimulation, or after destruction of the sinus node, or during ventricular pacing. In addition, 19 ECGs of human patients exhibiting normal P waves in the extremity leads and inverted P waves in V sub 1 to V sub 4 were subjected to vectorial analysis which indicated the superoanterior RA as the pacemaker site. Conversion of these rhythms to sinus rhythm or vice versa was demonstrated. It is suggested that this human arrhythmia represents a counterpart of RA ectopic activity observed in the intact canine hearts. M.M.

A71-27478 * Predictions of noise disturbance near large airports. W. R. Hazard (Texas, University, Austin, Tex.). *Journal of Sound and Vibration,* vol. 15, Apr. 22, 1971, p. 425-445. 14 refs. Contract No. NASw-1545.

The relationship between public annoyance with aircraft noise, objective measures of the noise itself, and mediating social or

psychological conditions which affect the noise-annoyance relationship is examined. Noise readings and interviews were conducted in areas within 12 miles of the major airports serving Atlanta, Dallas, Denver, and Los Angeles. Noise measures evaluated include the composite noise rating, and modified noise and number index, noise exposure forecast, and composite noise index. Seven major social-psychological predictors of annoyance are also identified. Based on the analysis, it is concluded that the generalized predictive equation for the revised measure of annoyance V will remove about 63% of the variance between predicted and observed mean values of V. G.R.

A71-27486 # Dynamics of various rhythms in the electrocorticogram of the cat during sleep and wakefulness (O dinamike razlichnykh ritmov elektrokortikogrammy koshki pri sne i bodrstvovanii). T. N. Oniani, Ia. K. Badridze (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR), and P. Mol'nar (Hungarian Academy of Sciences, Institute of Physiology, Pecs, Hungary; Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 21, Jan.-Feb. 1971, p. 128-134. 17 refs. In Russian.

Study of the dynamics of cortico- and subcorticograms of cats in different phases of sleep and wakefulness by a method involving spectral analysis and integration of the electroencephalogram. Data were obtained on 16 animals in a drowsy state, during presentation of an alimentary conditioned signal, and during stimulation of the reticular formation (RF). The threshold stimulation of the RF in slow sleep is found to depress the slow rhythms (delta and alpha), as well as the beta sub 1 waves in the auditory and visual cortex. The beta sub 2 rhythms did not undergo any changes. Supraliminal RF stimulation produced a more general depression of all cortical rhythms and simultaneously a behavioral arousal. Spontaneous arousal or that evoked by an alimentary conditioned signal was attended with the same EEG changes. In the hippocampus, as the stimulation increased, a general depression of all rhythms (desynchronization) set in gradually, as well as delta and theta wave dominance, thus testifying to the involvement of hypothalamic connections in local electrogenesis. A need for revision of the generally accepted definition of desynchronization is noted. A.B.K.

A71-27487 # Activity of visual cortex neurons in rabbits in the course of association of sound with rhythmic light (Aktivnost' neironov zritel'noi kory krolika pri assotsiatsii zvuka s ritmicheskim svetom). B. I. Kotliar and V. I. Maiorov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 21, Jan.-Feb. 1971, p. 157-163. 28 refs. In Russian.

Study of the dynamics of neuron activity in 52 visual cortex cells in unanesthetized rabbits in the course of association of sound with rhythmic light flashes. Conditioned changes were recorded in the activity of less than 20% of the cells. The average frequency of background activity of such units (9 pulses per second) was 1.5 times higher than that of the background activity of visual cortex units (6 pulses per second). No effects of conditioning were recorded in a group of units discharging with a background activity of less than 4 pulses per second. No definite relation was observed between the frequency of background activity and the presence of conditioned changes among units with a more frequent background rhythmicity. The absence of conditioned changes in some of the units with a relatively high excitability is attributed to the low total level of excitation in the neural network forming the synaptic inflow to the neuron in the course of association of indifferent stimuli. A.B.K.

A71-27488 # Changes in EEG and behavioral reactions at various levels of hypoxia (Izmenenie EEG i povedencheskikh reaktsii pri razlichnykh urovniakh gipoksii). N. A. Agadzhanian, I. Dvorzhak, M. Moravek (Institute of Aviation Medicine, Czechoslovakia), and L. V. Kaliuzhnyi. *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 21, Jan.-Feb. 1971, p. 176-183. 27 refs. In Russian.

Study of the relation between changes in EEG and behavioral reactions in rabbits and humans 'ascending' to various heights in a pressure chamber. It is found that under the action of increasing hypoxia both in animals and in humans a definite correlation exists between changes in EEG and disturbances of behavioral (in particular, conditioned reflex) reactions. It is therefore concluded that changes in EEG can serve as an indicator of disturbances of psychic activity under conditions of increasing oxygen insufficiency. A.B.K.

A71-27489 # Dependence of the properties of primary and secondary responses in the visual cortex on processes in the cone and rod apparatus of the retina (Zavisimost' svoistv pervichnogo i vtorichnogo otveta zritel'noi kory ot protsessov v kolbochkovom i palochkovom apparatakh setchatki). V. B. Val'tsev (Akademiia Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 21, Jan.-Feb. 1971, p. 197-200. 10 refs. In Russian.

Comparative study of the properties of primary and secondary responses of the visual cortex of anesthetized cats to the switching off of prolonged light stimuli (0.5 and 5 sec). A hypothesis that the primary response is predominantly related to the photopic retinal apparatus, while the secondary response is related to the scotopic apparatus is confirmed. That is to say, the primary response is shown to be related to exclusive functioning of the cone apparatus, while the secondary response is found to be related to exclusive functioning of the rod apparatus. A.B.K.

A71-27534 # Differences of interaural phase and level in detection and lateralization. Lloyd A. Jeffress and Dennis McFadden (Texas, University, Austin, Tex.). *Acoustical Society of America, Journal,* vol. 49, Apr. 1971, pt. 2, p. 1169-1179. 11 refs. PHS-supported research.

By employing the same narrow band of noise (50 Hz wide, centered at 500 Hz) as both masker and signal, and by introducing a phase-shifting network between the masking and signal channels, it is possible to control the phase angle alpha between the two. For a given SNR, controlling the phase angle alpha controls the relative magnitudes of the interaural phase (time) difference and the interaural difference in level between the stimuli at the two ears. When alpha lies between 0 and 90 deg and the signal is reversed at one ear relative to the other, the interaural time difference and the interaural level difference favor the same ear. However, when alpha is between 90 and 180 deg, the ear that leads in phase or time will receive the weaker stimulus, thus putting time and intensity into opposition as cues to the lateralization of the stimulus. Data on both detection and lateralization were obtained using the single-interval forced-choice procedure. M.M.

A71-27563 * # Thermal modeling of the human body - Further solutions of the steady-state heat equation. John C. Chato and Avraham Shitzer (Illinois, University, Urbana, Ill.). *AIAA Journal,* vol. 9, May 1971, p. 865-869. 6 refs. Grant No. NGR-14-005-103.

The thermal behavior of the human body has been modeled with particular emphasis on direct cooling of the skin by cooling tubes used in current extravehicular activity (EVA) space units. Steady-state analytical solutions have been obtained for several boundary conditions and for various values of the parameters involved. Although the results provide insight into the problem and even compare acceptably with some of the scant previous investigations, much more work is needed both analytically and, especially, experimentally before the numerical results can be considered reliable for biological purposes. The analysis presented herein is, nevertheless, applicable to any steady-state heat conduction problem in rectangular bodies with internal heat generation. (Author)

A71-27629 # Noise and its implications with the Indian Air Force. V. S. N. Murty and C. A. Verghese (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aero Medical Society of India, Journal,* vol. 13, Oct. 1970, p. 3-11. 16 refs.

Noise survey of various types of jet fighter-bomber aircraft. Overall sound pressure levels and frequency analysis during ground running for distances up to 100 ft for different angles were measured. Speech interference levels, perceived noise levels, and noise rating numbers for crew positions were calculated. The

maximum safe duration of noise exposure along with the maximum permissible ground running cycles for different aircraft are given from the viewpoint of hearing damage. Noise rating numbers with hearing defenders have been established. The requirements of hearing defenders for different types of aircraft are indicated. Guidelines for the location of briefing rooms and lecture rooms are suggested from the standpoint of limiting speech interference. M.M.

A71-27630 # **Recording of twelve-lead ECG during exercise.** N. Mohan Murali (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aero Medical Society of India, Journal,* vol. 13, Oct. 1970, p. 12-21.

Description of a wired monitoring system which facilitates the continuous recording of a 12-lead ECG before, during and after exercise virtually free from interferences, with the electrocardiographer able to select any of the leads. An unconventional electrode placement on the thorax has been found which gives a multilead ECG identical to that obtained with the conventional system for a varying electrical axis of the heart. Such a record can thus be easily interpreted using the existing criteria for evaluating ECG which becomes otherwise difficult with nonstandard records. A lighter and smaller dome-shaped floating electrode has been used which, although smaller in size, has an effective area twice that of a circular disk floating electrode of the same diameter, thus keeping the interelectrode impedance low. M.M.

A71-27631 # **Electroencephalographic examination of healthy aircrew.** V. Kumar (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aero Medical Society of India, Journal,* vol. 13, Oct. 1970, p. 22-25. 10 refs.

A group of 320 healthy aviators received an EEG examination as part of an evaluation of their fitness to fly high performance aircraft. The incidence of abnormal EEGs in this group was found to be 9.4%, the results being in agreement with those of Bennett (1964, 1967) and O'Connor (1964). The most common finding, which was labeled as abnormal, was that of marked reaction to hyperventilation, which indicates that the central nervous system of the individual is sensitive to pH changes in the blood. It is pointed out that hyperventilation is an important factor in aviators, and that EEG showing marked reaction to hyperventilation may have to be taken into consideration when assessing fitness for flying. M.M.

A71-27632 # **Functional assessment of orthopedic disabilities in aircrew.** S. P. Verma and P. C. Sharda (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aero Medical Society of India, Journal,* vol. 13, Oct. 1970, p. 26-30.

It has been observed that a strapped pilot can achieve 8 to 9 in. of additional functional reach in the case of upper limbs. This gain is pertinent to the assessment of reduction in static reach caused by anatomical shortening or ankylosis of the elbow. Minor restrictions at shoulder have been found to have more serious effect on function than restrictions at elbow. In the case of knee joint, it has been found that extension should always be complete, and limitations in flexion can only be accepted when the flexion movement is not less than 110 deg. The necessity to test each case of limb disability in aircraft cockpit to assess any deficit pertaining to critical functions in flight is brought out. (Author)

A71-27633 # **Use of tolerance tests in assessment of fitness after cranio-cerebral incidents.** H. Lakshminarayan. *Aero Medical Society of India, Journal,* vol. 13, Oct. 1970, p. 31-34.

Description of the results of an analysis of 48 cases. The tests administered were EEG, both normal and under provocative techniques, EEG under hypoxia, a glucose tolerance test, a thermal stress, and a g tolerance test. EEG and EEG under hypoxia showed abnormalities in the largest number of cases. Nine cases showed low heat tolerance compared to the control group. The tests proved to be a reliable yardstick for the assessment of fitness and could help to rationalize and decrease the period of observation and noneffectiveness. M.M.

A71-27634 # **Episode of unconsciousness in a jet fighter pilot - A case report.** P. M. Sundaram and P. S. Bajwa (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aero Medical Society of India, Journal,* vol. 13, Oct. 1970, p. 44-49.

The results of laboratory investigations were correlated with the flight profile and the sequence of events as it occurred in the air. The pilot experienced a blackout while flying jet fighter formation and ejected under emergency conditions due to nonseparation of the seat, sustaining various injuries. The pilot was susceptible to spatial disorientation having returned to flying duty after a 45-day leave. He may have been incapacitated by the simultaneous exposure to stresses such as accelerative forces, lowered blood sugar level, and hyperventilation. His failure to remember the events following ejection are easily explainable when one considers the stress of the emergency, ejection in an unusual attitude, the extensive spinal injuries sustained, and the sensory swamping due to the effects of wind blast at nearly 450 to 500 knots of speed. M.M.

A71-27658 # **Gas composition of alveolar air at different altitudes (Gazovyi sostav al'veoliarnogo vozdukha na razlichnykh vysotakh).** I. N. Cherniakov and I. V. Maksimov. *Voenno-Meditsinskii Zhurnal,* Mar. 1971, p. 69-73. In Russian.

A total of 210 alveolar air samples was analyzed in 35 experiments on 12 subjects who inhaled normal or pressurized air on the ground, or 100% oxygen, or pressure chamber air at simulated altitudes of 30 to 40 km. Special equipment with a mouthpiece, evacuated 5-liter rubber bags, and a connecting rubber tube with a system of stopcocks was used for alveolar air sampling. Oxygen, nitrogen and carbon dioxide contents and partial pressures were determined in alveolar air samples. The diverse variations in these air components during tests are discussed, noting that the variations in blood oxygen saturation with altitude followed the intrapulmonary oxygen pressure. V.Z.

A71-27659 # **Effect of rapid increases of noncompensated excess pressure in the respiratory system (Vliianie bystrykh uvelichenii nekompensirovannogo izbytochnogo davleniia v sisteme dykhaniia).** E. M. Peshkov. *Voenno-Meditsinskii Zhurnal,* Mar. 1971, p. 73-76. In Russian.

Tolerance to noncompensated respiratory system pressure was studied in 160 ground experiments and 60 pressure chamber experiments on 65 aircraft crew members who were exposed to abrupt ambient pressure drops without wearing a pressure suit. It was found that healthy respiration-trained subjects could sustain satisfactorily, even though under strain, inside-the-mask excess pressures of up to 800 mm water column for periods of up to 30 sec, in depressurized ambient air without compensation. V.Z.

A71-27675 • **Radiation-induced light flashes observed by human subjects in fast neutron, X-ray and positive pion beams.** Cornelius A. Tobias, Thomas F. Budinger, and John T. Lyman (California, University, Berkeley, Calif.). *Nature,* vol. 230, Apr. 30, 1971, p. 596-598. 8 refs. NASA-AEC-supported research.

Visual phosphene phenomena produced by fast neutrons at the Berkeley 184 inch cyclotron were investigated. The range of recoil atoms and nuclear fragments is much less than that for primary cosmic ray particles but the biological effects are probably qualitatively similar. X-ray phosphenes were studied in order to compare their characteristics with those of the neutron beam phosphenes, and also to find out whether X-ray phosphenes can be produced at the maximum dose rate possible of incidental X rays or gamma rays during the neutron exposures. G.R.

A71-27722 # **An increase in the resistance of mice to hypoxia under the influence of tranquilizers of the benzodiazepine series (Povyshenie ustoichivosti myshei k gipoksii pod vliianiem trankvilizatorov benzodiazepinovogo riada).** V. V. Zakusov and R. U. Ostrovskaia (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 71, Feb. 1971, p. 45-47. 18 refs. In Russian.

Study of the effect of diazepam, chlorodiazepoxide, and nitrazepam on the lifetime of white mice placed in a closed chamber with a reduced oxygen content (8.7 vol. %). All of these substances are found to increase the lifetime of the mice under conditions of hypoxia, diazepam being most effective in this respect. The protective effect of this preparation lasts more than four or five hours and has a wide therapeutic range; it manifests itself in a dose of 10 mg/kg, which amounts to one part in 24 of diazepam LD50. It is suggested that the described property of diazepam may be of use in clinical practice in cases of acute and chronic hypoxia. Meprobamate, which is a derivative of propanediol, and aminazine (chlorpromazine) do not exert a marked protective effect under conditions of hypoxia. A.B.K.

A71-27723 # **Analysis of the antigen composition of the tissues of the human heart, kidneys, liver, and spleen by isolation of 'pure' antibodies (K analizu antigennogo sostava tkanei serdtsa, pochki, pecheni i selezenki cheloveka posredstvom vydeleniia 'chistykh' antitel).** V. I. Sisenko, B. A. Simonian, and L. A. Arakelian (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 71, Feb. 1971, p. 73-75. 5 refs. In Russian.

Analysis of antibodies isolated from serums against tissues of the human heart, kidney, liver, and spleen. It is demonstrated that some antibodies react only with antigens of a particular organ, while others react with extracts from all four organs or two organs. Thus the isolated antibodies are shown to be narrowly specific and directed against strictly limited antigens. A.B.K.

A71-27724 # **Study of cancerogenic activity of aircraft engine soot in experiments on animals (Izuchenie kantserogennoi aktivnosti sazhi aviatsionnykh dvigatelei v opytakh na zhivotnykh).** A. B. Linnik, G. A. Smirnov, and L. M. Shabad (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 71, Feb. 1971, p. 83-87. 12 refs. In Russian.

Investigation of the blastomogenic activity of extracts of aircraft engine soot in experiments on first-generation C57 x CBA hybrid mice. The skin of the interscapular region of the animals was treated with extracts of soot from piston and gas turbine engines, or with a solution of benzopyrene or benzene. At the end of the experiment malignant tumors developed in animals treated with soot extracts or benzopyrene solution. Out of 58 mice treated with soot extract planocellular skin cancer developed in 52 cases, sarcoma in one case, carcinosarcoma in four cases, and metastases of cancer into lymph nodes in six cases. The cancerogenic activity of soot from both piston and gas turbine engines is thus established. A.B.K.

A71-27725 # **Morphogenesis of plate receptors of human transversostriated muscle (K voprosu o morfogeneze plastinchatykh retseptorov poperechnopolosatoi muskulatury cheloveka).** A. M. Zagrebin (Izhevskii Meditsinskii Institut, Izhevsk, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 71, Feb. 1971, p. 102-104. 10 refs. In Russian.

Study of the development and structure of plate receptors in skeletal muscles of 50 embryos, fetuses, and children up to five years by means of Gross-Schultze impregnation. Ten samples of different muscles of the trunk and extremities were taken for histological investigation. In muscles of the prominence of the thumb the formation of plate receptors commences in 3-1/2-month-old embryos, while in other muscles it starts somewhat later (4 to 4-1/2 months of embryogenesis). At the end of the prenatal period they attain a high degree of differentiation. In three-year-old children Vater-Pacini bodies do not differ externally from those of adults. The greatest number of plate receptors was found in muscles of the upper extremities. A.B.K.

A71-27742 # **Simulation of the internal sphere of the human organism (Modeliuvannia 'vnutrishnoi sferi' organizmu liudini).** M. M. Amosov, V. O. Lishchuk, B. L. Palets', S. A. Patskina, B. T. Agapov, V. I. Gaevs'kii, I. I. Ermakova, K. G. Liabakh, and V. P. Soloviov (Akademiia Nauk Ukrains'koi RSR, Institut Kibernetiki, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Mar.-Apr. 1971, p. 156-166. 9 refs. In Ukrainian.

Existing partial models and qualitative assessments having assigned quantitative measures are used to synthesize an overall, quantitative, heuristic model of the human inner organic system. The model comprises the complex of internal organs performing the main life functions of hemodynamics, gas exchange, thermal regulation, water-salt metabolism, and energy processes in normal and acute pathological states. Block diagrams are illustrated for the overall system and for the individual subsystems; statistical characteristics of a cardiovascular-system simulated by a digital computer are discussed. T.M.

A71-27743 # **Deoxyribonucleases in normal states and in pathology (Dezoksiribonukleazi v normi ta patologii).** M. Iu. Khursin (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Mar.-Apr. 1971, p. 175-182. 37 refs. In Ukrainian.

The activity of acidic and alkaline deoxyribonucleases was measured by a spectrophotometer and a horizontal viscosimeter in the urine of intact albino rats, in the blood serum of various animals, and in the blood serum of humans with lymphogranulomatosis. Alkaline deoxyribonuclease is more active than the acidic in the blood serum of mammals, while the reverse is true for birds, amphibians, and reptiles. The activity is strongly dependent on the presence of magnesium ions in both acidic and alkaline media. The blood serum of both sound humans and lymphogranulomatosis patients exhibits endodeoxyribonucleatic activity. No differences were seen in the enzyme activity of deoxyribonucleases from sterile and contaminated urine samples. T.M.

A71-27744 # **Method for measuring oxygen tension in the blood and in biological fluids (Metodika vimiriuvannia napruzhennia kisniu v krovi ta biologichnikh ridinakh).** V. Ia. Berezovs'kii, B. F. Nesterov, V. B. Sazonov, and V. M. Iachin (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev; Akademiia Nauk Ukrains'koi RSR, Spetsial'ne Konstruktorske Biuro, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Mar.-Apr. 1971, p. 272-276. 15 refs. In Ukrainian.

Description of an enclosed-electrode polarographic sensor of partial oxygen tension in blood, urine, amniotic fluid, mucous stomach membrane, and other fluids. The sensor unit is contained in the piston of a hypodermic needle and can measure sample volumes from 0.5 to 5.0 ml. Constant temperature is ensured by a thermostatic arrangement. T.M.

A71-27745 # **Device for artificial respiration at elevated gas pressure in a pressure chamber when reviving an organism that succumbed from rapid decompression (Pristrii dlia shtuchnogo dikhannia v barokomeri pid pidvishchenim gazovim tiskom pri ozhivlenni organizmu, shcho zaginuv vid shvidkoi dekompresii).** A. S. Skuratovs'kii and P. V. Gubatiuk (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Mar.-Apr. 1971, p. 276, 277. In Ukrainian.

Description of equipment for conducting artificial respiration in a pressure chamber when reviving an organism after clinical death caused by rapid decompression. All resuscitative operations are performed without removing the subject from the chamber. The equipment consists of a collar drawn over the subject's chest; the collar is inflated and deflated with the aid of electromechanical regulating valves. T.M.

A71-27752 # **Autoradiographic proof of the rhythmicity of DNA synthesis during the direct division of nuclei (Avtoradiografichni dokazi ritmichnosti sintezu DNK pri priamomu podili iadra).** V. I. Maliuk (Akademiia Nauk Ukrains'koi RSR, Institut Zoologii, Kiev, Ukrainian SSR). *Akademiia Nauk Ukrains'koi RSR, Dopovidi, Seriia B - Geologiia, Geofizika, Khimiia i Biologiia,* vol. 33, Feb. 1971, p. 168-171. 7 refs. In Ukrainian.

Tagged thymidine was injected two hours before decapitation into 36 albino rats slaughtered at 2-hr intervals during the day in a study of the DNA synthesis rhythm in the nuclei of endothelial cells of the aorta. These nuclei were chosen for the study because a previous radiographic study by the author (1970) showed that these cells divided by amitosis. A two-factor dispersion analysis of the radiographs indicated two maxima in the DNA synthesis during the day, suggesting that amitosis did not affect the rhythm of DNA synthesis in these cells. V.Z.

STAR ENTRIES

N71-21851# Federal Aviation Administration, Oklahoma City, Okla. Office of Aviation Medicine.

TOLERANCES TO THERMAL EXTREMES IN AEROSPACE ACTIVITIES

P. F. Iampietro Dec. 1970 13 p refs

(FAA-AM-70-22) Avail: NTIS

Tolerance for all hot environments cannot be defined by a single criterion. At least three types of tolerance are discussed which might occur in aerospace activities. The tolerance categories have been designated (1) pain limited, (2) heat storage limited and (3) systems limited. Pain limited exposures are of short duration and require very high temperatures. Heat storage limited exposures may last from minutes to hours and require high temperatures and low humidities. Systems limited exposures are of intermediate duration and require moderately high temperatures and high humidities. Author

N71-21852# Federal Aviation Administration, Oklahoma City, Okla. Office of Aviation Medicine.

COMPARISON OF STATUS VARIABLES AMONG ACCIDENT AND NONACCIDENT AIRMEN FROM THE ACTIVE AIRMAN POPULATION

Michael T. Lategola, Vincent Fiorica, Charles F. Booze, Jr., and Earl D. Folk Dec. 1970 19 p refs

(FAA-AM-70-18) Avail: NTIS

The distributions of age, weight, height, body weight/body surface area and ponderal index for the accident versus nonaccident segments of the active airman population were compared for years 1966–1967. The differences in the distributions of these five status variables in the accident versus non-accident population segments were statistically significant in all instances. The accident rate increased with age and was highest for ages of 60 or greater. The accident rate also increased with the variables related to increasing body weight. The interrelationship between age and body weight represents the most obvious focus for future research efforts. Various paired combinations of age with each of the other four variables are potentially capable of narrowing the focus of where, within the active airman population, to search for undetected human factors associated with accidents. Author

N71-21853# Federal Aviation Administration, Oklahoma City, Okla. Office of Aviation Medicine.

A DEVICE AND METHOD FOR RAPID INDIRECT MEASUREMENT OF HUMAN SYSTOLIC AND DIASTOLIC BLOOD PRESSURES

Michael T. Lategola and Hiley F. Harrison Dec. 1970 25 p refs

(FAA-AM-70-21) Avail: NTIS

An indirect blood pressure measuring device and method have been evolved for human use. This system is capable of providing 30 measurements each of systolic and diastolic pressures per minute. The system utilizes two brachial blood pressure cuffs (one on each arm) and fully automatic cycling for each pressure measurement. The main advantages of this system are: (1) minimum circulatory impedance during each measurement; (2) the capability of measuring rapid blood pressure transients; and (3) the complete avoidance of all the inherent risks of intra-arterial catheterization. Author

N71-21888# Joint Publications Research Service, Washington, D.C.

BIOCLIMATOLOGY OF CENTRAL ANTARCTICA AND HUMAN ACCLIMATIZATION

I. I. Tikhomirov 10 Mar. 1971 93 p Transl. into ENGLISH from the book "Bioklimatologiya Tsentral'noy Antarktidy i Akklimatizatsiya Cheloveka" Moscow, Nauka Publishing House, 1968 p 76–161

(JPRS-52579) Avail: NTIS

Hygienic and clinical-physiological aspects of living in the polar region are studied. Problems connected with the facility include heating, lighting, and ventilating, and related considerations of clothing, preparation of food and water, and presence of microflora are described. The effects of living in the polar region on cardiovascular system, respiration, metabolism and thermal regulation, and nervous system are discussed. N.E.N.

N71-21890# Joint Publications Research Service, Washington, D.C.

PSYCHOPHYSIOLOGICAL ANALYSIS OF WORK ACTIVITIES

G. M. Zarakovskiy 30 Mar. 1971 98 p refs Transl. into ENGLISH of the book 'Psikhofiziologicheskiy Analiz Trudovoy Deyatelnosti' Moscow, Nauka, 1966 p 1–114

(JPRS-52752) Avail: NTIS

The procedures for analyzing work processes of the administrative, control type are presented. The method is based on general control theory, or cybernetics, and uses algorithm theory, probability theory, and mathematical logic. Means for obtaining quantitative characteristics of psycophysiological distinctions are described. N.E.N.

N71-21899 Virginia Univ., Charlottesville.

THE CUTANEOUS PERCEPTION OF BINARY PATTERNS

Charles Cedric Hodge (Ph.D. Thesis) 1969 88 p

Avail: Univ. Microfilms: HC $4.60/Microfilm $3.00 Order No. 70-4800

A series of four experiments were performed using both whole and partial reporting techniques to investigate the ability of college students to reproduce binary patterns formed by electrically stimulating the finger tips. The results using the whole report technique indicated that while knowledge of results did not significantly facilitate performance, performance did improve with practice. In addition, evidence was obtained that the subjects given knowledge of results in the complete-report experiment tended to make fewer errors in reporting left-hand stimuli at the expense of making more errors in reporting right-hand stimuli. Evidence that decay of availability of memory to recall was not a major factor was obtained in the one-hand partial-report experiment, in which equating the stimulus-recall interval for the two hands did not significantly change the errors per hand for either hand. This inference is also supported by the fact that report accuracy did not improve in the single-digit partial-report experiment. Dissert. Abstr.

N71-21900# Swift and Co., Chicago, Ill. Research and Development Center.

FABRICATION OF FOOD BARS BASED ON COMPRESSION AND MOLDING MATRICES Final Report, 23 Sep. 1968 - 22 Sep. 1969

Robert L. Pavey Jun. 1970 39 p

(Contract DAAG17-67-C-0068)

(AD-717289; USA-NLABS-TR-70-67-FL) Avail: NTIS CSCL 6/8

Dried foods, some plasticized to prevent fragmentation, were compressed with appropriate binders into bars of approximately equal size, density and caloric content. Bars representing the following food items were designed, formulated, fabricated and evaluated for physical, chemical and sensory characteristics after storage for 3 months at 38C: (1) Citrus Fruit Drink (2) Hot

Chocolate Beverage (3) Cream of Mushroom Soup (4) German Potato Salad (5) Cole Slaw (6) Pineapple-Cottage Cheese Salad (7) Welsh Rarebit (8) Crab Meat Cocktail (9) Chocolate Pudding (10) Pineapple Fruit Pudding. Complete information on all formulations and processing is supplied. In accordance with design requirements bars were rated by a taste panel as acceptable for consumption from the dry-compressed state and for consumption after rehydration for 20 minutes in water at 70C. (25C for items consumed at room temperature.) Bars were evaluated for cohesiveness, dimensional stability under pressure, ease of shear by the incisors and subsequent mastication. Observations on free fatty acids, peroxide value and browning (fluorescence units) are recorded for each bar at the time of fabrication and after the referenced storage. Author (GRA)

N71-21912# Submarine Development Group 1, San Diego, Calif.
BREATHING IMPEDANCE OF THE MARK 8 AND MARK 11 SEMICLOSED UNDERWATER BREATHING APPARATUS Final Report, Jun. 1969 Aug. 1970
Mark E. Bradley, James Vorosmarti, Jerry Merz, Paul J. Heckert, and John C. Kleckner 17 Aug. 1970 203 p refs
(AD-717355; RR-1-70) Avail: NTIS CSCL 6/11

A diver breathing with an underwater breathing apparatus will have his ventilatory capability degraded by an inherent breathing impedance in the equipment used. The impedance of both the equipment and the divers respiratory system will increase as ambient pressure increases. There is little information available concerning the deleterious physiological effects imposed on the diver breathing with an underwater breathing apparatus. A paucity of information delineating bioengineering specifications for breathing resistance in underwater breathing apparatus exists. This study was undertaken to measure the breathing resistance encountered by an exercising subject using a semiclosed underwater breathing apparatus. Objectives of the study were: delineation of physiological effects imposed by equipment resistance in the presence of gases of normal and increased density; development of techniques to evaluate breathing resistance in diving equipment; tenative establishment of specifications for engineering design of diving equipment in terms of breathing resistance. All objectives of the study were attained. Author (GRA)

N71-21913# Naval Aerospace Medical Inst., Pensacola, Fla. Research Lab.
COMPARISON OF TRACKING TASK PERFORMANCE AND NYSTAGMUS DURING SINUSOIDAL OSCILLATION IN YAW AND PITCH
Alan J. Benson (Royal Air Force Inst. of Aviation Med.) and Fred E. Guedry, Jr. Oct. 1970 25 p refs Prepared in cooperation with Army Aeromedical Res. Lab.
(AD-717596; NAMRL-1123; USAARL-71-12) Avail: NTIS CSCL 6/16

The problem was to compare performance limits and nystagmus induced by angular accelerations about the pitch and the yaw axes. Sinusoidal torsional oscillation degraded subjects performance of a compensatory tracking task because inappropriate nystagmic eye movements impaired visibility of the display. Responses to angular oscillation in yaw and pitch were compared. During angular motion in the pitch-forward direction the nystagmus frequency and slow phase velocity, and the consequent performance decrement, were significantly greater than during the pitch-back half cycle. No such asymmetry was found during oscillation in yaw where the nystagmus measures and error scores were similar to those obtained in the pitch-back half cycle. The poorer suppression of vestibular nystagmus during pitch-forward motion is attributed to the higher frequency and smaller amplitude of downbeating nystagmus. Angular oscillation in pitch induced motion sickness more rapidly than a comparable yaw-axis stimulus. This was probably caused by differences in the dynamic response of vertical and lateral canals and the greater mismatch of canal and gravireceptor signals during oscillation in pitch. Author (GRA)

N71-21926*# Welson (B.) and Co., Inc., Hartford, Conn.
HANDBOOK OF GARMENT AND ACCESSORY SYSTEMS SELECTION CRITERIA FOR A SPACE STATION
Nov. 1970 247 p refs
(Contract NAS9-10407)
(NASA-CR-114953; BW-221) Avail: NTIS CSCL 06Q

The criteria by which crew garment systems, garment support systems, and space vehicle accessory items may be evaluated for use in a space station are presented. The handbook is not intended for use as the absolute criteria for design, rather, it is to familiarize persons of engineering discipline with the methodology and rationale involved. In addition to presenting basic data on fabric technology, garment construction, thermal aspects of clothing, laundry systems, and vehicle interface and logistics considerations, appendices have been included that present an illustrative example of how to apply the data contained in the handbook to systems selection; contains a glossary of terms most commonly used in textile technology; defines a method of size clothing and presents current astronaut/scientist population sizing data, and fabric characteristics in selecting fabric items for space station use. Author

N71-21981 Advisory Group for Aerospace Research and Development, Paris (France).
THE EFFECTS OF GRAVITY AND ACCELERATION ON THE LUNG
D. H. Glaister Slough, Engl. Techvision Serv. Nov. 1970 223 p refs
(AGARDograph-133) Copyright. Avail: Issuing Activity

A description is given of the mechanics of the lungs under gravitational and accelerative stresses. The effects upon the cardiovascular system and upon the performance of the lungs, together with the consequential effects are discussed in detail. Some information is provided on the method of increasing tolerance to acceleration. A bibliography and index are included. Author

N71-22001# Joint Publications Research Service, Washington, D.C.
HUMAN PHYSIOLOGY UNDER CLIMATIC CONDITIONS OF THE USSR
11 Mar. 1971 70 p refs Transl. into ENGLISH from the book "Fiziologiya Cheloveka V Prirodnykh Usloviyakh SSSR" Leningrad, Nauka Press, 20 Mar. 1969 189 p
(JPRS-52594) Avail: NTIS

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N71-22002# Joint Publications Research Service, Washington, D.C.
SEASONAL CHANGES IN THE ORGANISM UNDER FAR

EASTERN MONSOON CONDITIONS
V. A. Matyukhin *In its* Human Physiol. Under Climatic Conditions of the USSR 11 Mar. 1971 p 1–10 refs

Avail: NTIS

Thermoregulation and basal metabolism were studied in subjects acclimatized to the monsoon climate and in those recently arrived. Specific seasonal and daily differences were noted between the two groups, and also between them and persons in non-monsoon climates. The most significant changes during the monsoon season were a lowering of the level of excitability and functional mobility of the central nervous system. Thermoregulation has seasonal and daily peculiarities. Details are given on the seasonal and daily fluctuations in blood pressure, pulse pressure, and blood composition. N.E.N.

N71-22003# Joint Publications Research Service, Washington, D.C.
AGE PECULIARITIES OF THERMOREGULATION AND THEIR SEASONAL SHIFTS UNDER HOT CLIMATIC CONDITIONS
K. Z. Kafarova *In its* Human Physiol. Under Climatic Conditions of the USSR 11 Mar. 1971 refs p 11–21

Avail: NTIS

Seasonal variations in thermoregulation were studied in residents in a hot, dry climate (Baku) with respect to age and sex. Measurements were made of pulse rate, blood pressure, respiration, oxygen consumption and carbon dioxide release, energy expenditures, sweating, and skin and body temperatures. Specific differences were noted and are discussed. An overall pattern to age shifts was determined: the thermoregulatory equilibrium in preschool children appears to be inadequate in summer and begins to stabilize in children of the prepuberty age group. N.E.N.

N71-22004# Joint Publications Research Service, Washington, D.C.
CERTAIN FEATURES OF ADAPTATION TO HIGH ALTITUDE CONDITIONS IN TRAINED AND UNTRAINED INHABITANTS OF VARIOUS GEOGRAPHIC ZONES
M. F. Avazbakiyeva et al *In its* Human Physiol. Under Climatic Conditions of the USSR 11 Mar. 1971 p 22–28

Avail: NTIS

Physiological effects in experienced and novice mountain climbers from northern and southern regions were studied at altitudes between 2600 and 3600 meters above sea level. Measurements were made on the cardiovascular system, oxygen saturation of the arterial blood, changes in stimulation of the respiratory center, EKG, basal metabolism, and pulmonary respiration. More compensatory potentials on the part of the cardiovascular system, respiratory system and basal metabolism were observed among subjects from southern areas under conditions of rest and muscular exertion. This was especially pronounced in southern experienced climbers. N.E.N.

N71-22005# Joint Publications Research Service, Washington, D.C.
PROLONGED ACCLIMATIZATION OF MAN IN THE CENTRAL ASIAN MOUNTAINS
M. M. Mirrakhimov *In its* Human Physiol. Under Climatic Conditions of the USSR 11 Mar. 1971 p 29–45 refs

Avail: NTIS

Physiological responses of persons having lived five years in the Pamirs and of natives were investigated. Measurements were made of hyperventilation, erythrocyte count and hemoglobin, venous pressure, blood flow rate, right ventricular strain, and oxygen consumption. The data show that complete acclimatization to high altitudes is accompanied by the establishment of physiological functions at a new level qualitatively and quantitatively. N.E.N.

N71-22006# Joint Publications Research Service, Washington, D.C.
HUMAN ACCLIMATIZATION AT MEDIUM ELEVATIONS IN THE MALYY KAVKAZ
S. M. Bedalova *In its* Human Physiol. Under Climatic Conditions of the USSR 11 Mar. 1971 p 46–54 refs

Avail: NTIS

Circulation, respiration, and pulmonary gas exchange in permanent residents of medium elevations were studied and found to be considerably intensified. It was found that acclimatization is characterized by definite phases. In the transitional phase there are increases in pulse rate, venous pressure, blood flow rate, cardiac minute and stroke volume, pulmonary ventilation, depth and rate of respiration, and gas exchange, along with decreases in arterial pressure and arterial-venous oxygen differential. The second phase shows incomplete adaptation, and emerges at the end of the second week. The final phase is one of relatively stable adaptation, and changes in most physiological functions become clearly stabilized. N.E.N.

N71-22007# Joint Publication Research Service, Washington, D.C.
PHYSIOLOGICAL FUNCTIONS IN ACCLIMATIZED MAN UNDER CONDITIONS OF KIRGIZIYA AND THEIR SEASONAL SHIFTS
L. G. Filatova *In its* Human Physiol. Under Climatic Conditions of the USSR 11 Mar. 1971 p 55–68 refs

Avail: NTIS

Basal metabolism data on persons 18 to 40 years old are discussed. The climate of the mountainous region is characterized by sharp changes in temperature, illumination, low pressure, and high ionization of air. Details are discussed on blood composition, respiration, thyroid functions, blood pressure, hypoxia, and the lack of correlation between energy metabolism and body temperature. N.E.N.

N71-22065# Joint Publications Research Service, Washington, D.C.
BIONICS AS APPLIED TO ANALYTICAL RESEARCH
E. T. Gaynullina *In its* Atmospheric Studies at Chem. Enterprises 9 Mar. 1971 p 153–169 refs
Avail: NTIS

Bionics research reviewed includes the use of enzymes to investigate toxic compounds and the simulation of the olfactory system of animate organisms. The bionics model of the olfactory system is applicable in the analysis of industrial air pollution. E.C.

N71-22115# Naval Medical Research Inst., Bethesda, Md.
GROWTH OF ESCHERICHIA COLI IN HIGH PRESSURE HELIUM OXYGEN GAS ATMOSPHERES
Norbert A. Schlamn and James E. Perry 3 Dec. 1970 11 p refs
(AD-717404; Rept-1) Avail: NTIS CSCL 6/13

Growth of Escherichia coli strain W was accelerated by pressurization to 68 atm (1000 psig) with helium-oxygen gas atmospheres. The acceleration appeared to be related to sequestration of iron and more efficient iron utilization by pressurized cells. Author (GRA)

N71-22130# Dayton Univ. Research Inst., Ohio.
RESEARCH ON A DISTRIBUTED PARAMETER MATHEMATICAL MODEL OF THE HUMAN BODY IN

DYNAMIC MECHANICAL ENVIRONMENTS Final Technical Report, 16 May 1969 15 May 1970
Horst E. Krause and Mehdi Shirazi Dec. 1970 152 p refs
(Contract F33615-69-C-1681)
(AD-717764; UDRI-TR-70-47; AMRL-TR-70-113) Avail: NTIS CSCL 6/2

The report presents a literature survey of the present state of the art of lumped and distributed parameter models of the human body. Modeling techniques using elastic and viscoelastic media are considered. It is concluded that lumped parameter models of an increased number of degrees-of-freedom are necessary to improve model quality. Computer programs are presented that should simplify such an effort. In particular, the numerical values of the system parameters can be determined with greater accuracy. The partial development of a multi-degree-of-freedom model is demonstrated. The extensive use of the mentioned computer programs should result in considerably more complex models than are available now. No whole-body distributed parameter models have been proposed in the literature. Existing models represent mainly skeletal sections such as the spinal column. A model of the spinal column is proposed in this report that considers the discontinuity in bending stiffness between the lumbar and thoracic spine and the curvature of the lumbar spine. This type of model appears to be very promising because it seems to explain some observed effects attributed to nonlinear properties. It is also recommended that research be initiated to develop hybrid models, that is, models consisting of both lumped parameter and distributed parameter sections. Author (GRA)

N71-22151# School of Aerospace Medicine, Brooks AFB, Tex.
STATUS OF PURE-TONE AUDIOMETRY IN USAF HEARING PROGRAMS Final Report, Jul. 1969 Apr. 1970
Donald S. Gasaway and Harrell C. Sutherland, Jr. Nov. 1970 19 p refs
(AD-717846; SAM-TR-70-68) Avail: NTIS CSCL 6/16

Pure-tone audiometry is used in the U. S. Air Force in support of three testing programs: Audiometric monitoring of persons routinely exposed to potentially hazardous noise; determining compliance with physical examination profiles (entrance into general service and certain career fields and continuance and separation evaluations); and diagnostic evaluations (differential diagnosis and aural rehabilitation). The report provides insight concerning the status of audiometers and autiometry used at USAF medical activities. Major emphasis is given to simple pure-tone audiometry used to monitor the hearing of persons included in the Air Force hearing conservation program and audiometry performed to determine physical profiles. Guidance is provided concerning primary and secondary factors which contribute to errors in autiometry. Author (GRA)

N71-22161 School of Aerospace Medicine, Brooks AFB, Tex.
USE OF MODULATING FUNCTIONS FOR SYSTEM IDENTIFICATION Technical Report, May 1969 May 1970
Thomas E. Simondi Nov. 1970 37 p refs
(AD-717847; SAM-TR-70-54) Avail: NTIS CSCL 6/16

A major goal of research on physiologic processes is the derivation of a mathematical model of the system under test. With the growth of modern control theory, mathematical methods have been and are being developed to reliably obtain parameters of an estimated system from experimental data. The report investigates the modulating function method of system identification first described by Loeb and Cahen. The method is applicable to systems described by linear differential equations, and tests of the method show that it is suitable for use with both analytic and operational data. Certain restrictions exist on the method, however. To test the method, a general model of the closed-loop carotid blood pressure control system was derived and tested. Author (GRA)

N71-22201# Joint Publications Research Service, Washington, D.C.
HYDRODYNAMIC PROBLEMS OF BIONICS
12 Mar. 1971 160 p refs Transl. into ENGLISH of Bionika (Kiev), no. 4, 1970 p 3-120
(JPRS-52605) Avail: NTIS

The articles presented pertain to the general hydrodynamics of aquatic animals; the possibilities of applying telemetry devices to study the boundary layer on a live dolphin; qualitative information on the structure of dolphins and fish; and traveling wave problems.

N71-22203# Joint Publications Research Service, Washington, D.C.
KINEMATIC SWIMMING CHARACTERISTICS OF SOME FAST MARINE FISH
V. Ye. Pyatetskiy *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 12-23 refs
Avail: NTIS

Data are presented on the swimming speed and kinematics of three Black Sea fish species; bonito, striped mullet, and bluefish. Results were obtained from experimental investigations conducted on a biohydrodynamic unit capable of taking stills and motion pictures of moving objects; determining hydrodynamic resistance and speed; visually observing the kinematics of movement; and conducting energy studies at speeds up to 4 m/sec throughout a requisite time interval. A.L.

N71-22204# Joint Publications Research Service, Washington, D.C.
HYDRODYNAMIC SWIMMING CHARACTERISTICS OF SOME FAST MARINE FISH
V. Ye. Pyatetskiy *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 24-31 refs
Avail: NTIS

Study of the kinematics and energetics of movement of fast swimming fish and other marine animals, as well as a determination of their hydrodynamic drag, is of considerable practical interest from the viewpoint of applying knowledge gained in hydrobionics to various areas of technology. Some hydrodynamic characteristics of three Black Sea salt water fish are presented in graphical and tabular form. The approximate theory of marine animal swimming mechanism used to calculate these characteristics is a simple and reliable method of evaluating the hydrodynamic efficiency of locomotive organs, particularly the caudal fin. A.L.

N71-22205# Joint Publications Research Service, Washington, D.C.
FREQUENCY CHARACTERISTICS OF AQUATIC ANIMALS
S. V. Pershin *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 32-36 refs
Avail: NTIS

Analysis of existing experimental data indicates that aquatic forward locomotion of fair duration is with good approximation not only a periodic but harmonic process as well. An aquatic animal's center of gravity moves in almost rectilinear and practically uniform fashion, while the bending oscillations of points on the body surface and tail fin thruster are described by means of simple harmonics. From the standpoint of the theory of mechanical oscillations of rigid bodies, the prolonged forward movement of aquatic animals represents a sustained harmonic oscillation. A system of one and two parameter, dimensional and dimensionless characteristics graphs are proposed to achieve a fuller quantitative description of the swimming mechanism of aquatic animals. A.L.

N71-22206# Joint Publications Research Service, Washington, D.C.
RESONANCE CONDITIONS IN THE SWIMMING OF

DOLPHINS

S. V. Pershin *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 37–43

Avail: NTIS

It has been demonstrated that during more or less prolonged forward locomotion of a dolphin, with constant regime; the flexing-oscillating motions of the animal's body and flukes are harmonic, whereby the amplitude frequency characteristic curve shows marked resonance, which dolphins adhere to most frequently in sustained swimming. Proof of these features of the swimming mechanism of dolphins was obtained by use of available experimental materials and underwater photography. Results indicate that dolphins do not fear resonance conditions, and that such conditions are normal and useful to these aquatic animals. A.L.

N71-22207# Joint Publications Research Service, Washington, D.C.

PHYSIOLOGICAL SUBSTANTIATION OF GRAY'S PARADOX

O. G. Karandeyeva et al *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 44–53 refs

Avail: NTIS

The assumed discrepancy between the necessary and real power output of a dolphin, termed Gray's paradox, led to the hypothesis of the existence of mechanisms which effectively reduce drag by laminarizing the boundary layers. Existing data on dolphin experiments were examined in order to evaluate the possibilities and reliability of calculating locomotion power output on the basis of data in literature. Results indicate that adequate experimental data are lacking to substantiate or reject Gray's paradox, and particularly for quantitative evaluation. A.L.

N71-22208# Joint Publications Research Service, Washington, D.C.

BIOLOGICAL EFFICIENCY OF SOME MARINE FISH

L. F. Kozlov *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 54–56 refs

Avail: NTIS

Biological efficiency is defined as the ratio of mechanical energy expended by a fish in swimming to the energy produced by the organism during locomotion and determined on the basis of oxygen comsumption. Analysis of data obtained as a result of theoretical investigations of the bioenergetics and hydrodynamics of marine fish indicates that the biological efficiency of marine fish increases as speed of locomotion increases. A.L.

N71-22209# Joint Publications Research Service, Washington, D.C.

MANEUVERABILITY AND CONTROLLABILITY OF DOLPHINS

M. K. Maslov *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 57–61 refs

Avail: NTIS

Studies of the swimming of dolphins shows the perfection of their hydrodynamic characteristics and the utility of various adaptations of their organism to the water ambient, adaptations which give these animals high relative speeds and unusual economy of motion from an energetics standpoint. The maneuvering qualities of the dolphin as a hydrodynamic structure attest to the dolphin's superiority over manmade devices. The basic features of the biological implementation of maneuvering, as well as the characteristics of the maneuverability and controllability of dolphins were examined and compared with the performance characteristics of manmade devices. Computations are presented and discussed for a 180 degree turn maneuver for: dolphins; experimental submarine Albacore; and a high speed nuclear submarine of the Skipjack class. A.L.

N71-22210# Joint Publications Research Service, Washington, D.C.

ELEMENTS OF HYDROSTATICS OF DOLPHINS

D. A. Morozov et al *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 62–67 ref

Avail: NTIS

Hydrostatic factors affecting the diving capabilities of dolphins were investigated. Discussed in detail are: (1) pressure increase on lungs and air sacs during dives; (2) thermoregulation mechanism; (3) hydrostatic pressure effects on body; (4) change of volume of air cavities; and (5) buoyancy. A.L.

N71-22212# Joint Publications Research Service, Washington, D.C.

PROPULSIVE TAIL MUSCULATURE OF THE ATLANTIC COMMON DOLPHIN

G. B. Agarkov et al *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 77–81 refs

Avail: NTIS

Morphological examinations were conducted to investigate the propulsive muscle functions and nervous system in the tails of common dolphins. The employment of impregnation methods permitted discovery in the region of the tail musculature a great number of various nerve structures in the form of nerve plexus, terminal endings, receptor sensors, and myoneural junctions. The effectiveness of the motor musculature of the back and caudal region of the dolphin was determined in large measure by the features of its attachment to the mastoid and transverse processes of the vertebrae, as well as to the hemal ossicles. The data obtained on innervation of the muscles attest to the presence of direct linkage and feedback between the nerve terminations in the muscles and tendons on the one hand and the central nervous system on the other. Consequently regulation of the functions of the musculature is actively supervised by the central nervous system. A.L.

N71-22213# Joint Publications Research Service, Washington, D.C.

STRUCTURE AND INNERVATION OF THE COMMON INTEGUMENT OF BLACK SEA DOLPHINS IN CONNECTION WITH ITS PROTECTIVE FUNCTION

G. B. Agarkov et al *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 refs

Avail: NTIS

The problem of protection of the internal tissues and organs of dolphins during deep dives from the high hydrostatic pressure characteristic of these depths was investigated. The skin performs the primary protective function and during the process of evolution has apparently acquired properties enabling the skin to withstand considerable pressures. The skin of the dolphin consists of three main layers: epidermis; dermis with cutaneous muscle; and subcutaneous fatty tissue. Each layer has its own features and protects the tissues and organs in a different manner and to a different degree. The structure and innervation of each of the three layers is described and discussed. A.L.

N71-22214# Joint Publications Research Service, Washington, D.C.

SOME FEATURES OF THE HISTOSTRUCTURE AND INNERVATION OF THE FRONTAL PROMINENCE OF BLACK SEA DOLPHINS

B. G. Khomenko *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 89–98 refs

Avail: NTIS

Detailed studies of the morphological peculiarities of the frontal prominence which, it is presently believed, constitutes one of the elements of the dolphin's echo location apparatus were conducted. Results of laboratory studies of the neural structures of the frontal cushion of the harbor porpoise, common dolphin, and bottle-nosed dolphin are presented. A.L.

N71-22215# Joint Publications Research Service, Washington, D.C.

SOME PECULIARITIES OF THE STRUCTURE OF THE SKIN OF SHARKS

O. B. Chernyshov et al *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 99–107 refs

Avail: NTIS

Histological investigations were made of 32 skin specimens taken from various areas of the spiny dogfish. Results of study of change in placement of the structure of the placoid scales on the shark's body, their quantity per unit of body surface, shapes of spines on various parts of the body surface, quantity and placement of mucus cells on the body, and effects of these elements on producing drag reducing mechanisms are discussed. A.L.

N71-22216# Joint Publications Research Service, Washington, D.C.

PRELIMINARY RESULTS OF A STUDY OF TEMPERATURE DISTRIBUTION OF THE BODY SURFACE OF DOLPHINS

V. V. Babenko et al *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 108–113 refs

Avail: NTIS

Dolphin skin surface temperature measurements were made with type MT-54 semiconductor microthermistors. The extreme sensitivity of the MT-54 permitted measurements to be made without using an amplifier. The electrical signal from the sensing element was carried by the wires to a measuring bridge and onto an N-700 oscillograph. Skin temperatures were measured on three species of dolphin: common dolphin, bottle-nosed dolphin, and harbor porpoise. A measuring arrangement was used that permitted temperature measurements on the entire body surface. Test data indicate that in a stationary state the temperature difference between the skin surface and the water does not exceed 1 C. Measurements show that the temperature drop between skin surface and water is proportional to the animal's available energy with the temperature differential being greater in a faster specimen. A.L.

N71-22217# Joint Publications Research Service, Washington, D.C.

SONIC ACTIVITY OF THE COMMON DOLPHIN AND HARBOR PORPOISE IN VARIOUS SITUATIONS

A. A. Titov et al *In its* Hydrodyn. Probl. of Bionics 12 Mar. 1971 p 114–122 refs

Avail: NTIS

Results are presented of acoustic investigations conducted on five common dolphins and three harbor porpoises. The specimens were studied by means of monitoring and recording phonations in an 18 × 13 × 2 tank and in a 40 × 8 × 10 meter open air sea water pen. The animals' behavior was observed and sounds in the tank were recorded in a frequency band of 60 Hz-100 kHz. In the pen portable sound equipment was used, with a frequency range of 60 Hz–13 kHz. Acoustical equipment consisted of a set of ceramic hydrophones, amplifiers, sound pressure meter, and tape recorders. Signal analysis was done with a cathode ray tube and loop oscillograph, as well as ultrasonic and audio frequency spectrometers. Observations indicated that the acoustic signals produced by the common dolphin can be divided into four groups: (1) clicks emitted in trains and used for echo location; (2) quacks, squawks, blats; (3) whistles; and (4) other sounds perceived as cries, barking, chirping, smacking, dry twig snapping, laughing, and clanking. Harbor porpoise vocalization activity was much less than that of the common dolphin and bottle-nosed dolphin. A.L.

N71-22240# School of Aerospace Medicine, Brooks AFB, Tex.

RESPONSES IN THE CARDIOVASCULAR SYSTEM OF RATS INTERMITTENTLY EXPOSED TO AN ALTITUDE OF 18000 FEET

Lloyd L. Foster Dec. 1970 19 p refs

(AD-717851; SAM-TR-70-93) Avail: NTIS CSCL 6/19

The study involved a comparison of ground-level rats to rats that were exposed to an altitude of 18,000 feet, six hours a day, for 5, 10, 15, and 20 days, respectively, in order to determine any differences in the responses of the cardiovascular system. Upon comparison of the two groups, the 10, 15, and 20-day altitude rats showed a significant increase in diastolic pressure and systolic pressure. The 10-day altitude group also had an increase in heart rate. Exposure of rats to an altitude of 18,000 feet, six hours a day for 5 days, showed no changes in the cardiovascular measurements when compared to ground-level rats. Intravenous injection of epinephrine increased blood pressure in all groups of rats; this was more pronounced in the 10, 15, and 20-day ground-level group. The 5-day ground level and altitude groups showed no difference in blood pressure rise after the injection of epinephrine. Author (GRA)

N71-22253# School of Aerospace Medicine, Brooks AFB, Tex.

EFFECTS OF MICROWAVES ON BACTERIA IN FROZEN FOODS Final Report, 15 Sep. 1969–23 May 1970

Raymond A. Madson, Joseph T. Cordaro, Ronald L. Koller, and Gary E. Voelker Nov. 1970 13 p refs

(AD-717853; SAM-TR-70-87) Avail: NTIS CSCL 6/8

The effects of freezing and microwave heating on deliberately contaminated precooked frozen meal components were studied. Freezing conditions and food type appeared to influence survival of Escherichia coli as time increased, but Streptococcus faecalis exhibited no apparent change. Twenty-seven groups of samples representing 17 different foods were analyzed. The results suggest that the microwave heating will satisfactorily kill or reduce incidental and introduced microorganisms to a safe level providing the microwave exposure time is correlated with the size and type of food substance being treated. Author (GRA)

N71-22254# Wisconsin Alumni Research Foundation, Madison.

NUTRIENT ANALYSIS OF AEROSPACE FOODS Final Report, Sep. 1966–Feb. 1969

Jerry L. Moore, Roy E. Chapin, and John E. Vanderveen Brooks AFB, Tex. School of Aerospace Med. Nov. 1970 18 p refs

(Contract F41609-68-R-0026)

(AD-717859; SAM-TR-70-75) Avail: NTIS CSCL 6/8

Concentrations of energy, fat, nitrogen, chloride, and the cations of 14 different metallic elements were measured in 219 samples of 74 space food items. Although the compiled data do not permit calculation of standard values, this tabulation will be a useful reference for those interested in the nutritive quality of state-of-the-art, space-type food items. Author (GRA)

N71-22255# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

AEROSOL BEHAVIOR IN HIGH PRESSURE ENVIRONMENTS Annual Report, 1 Mar. 1970–15 Jan. 1971

Robert A. Gussman and Anthony M. Sacco 15 Jan. 1971 20 p refs

(Contract N00014-69-C-0228)

AD-717733; BBN-2070; AR-3) Avail: NTIS CSCL 6/11

The report details further efforts on filtration experimentation in the high pressure environment. Additional theory relevant to high pressure filtration has been uncovered in the open literature and is presented and discussed. Experimental apparatus for the study of liquid aerosol generation in the high pressure environment has been constructed and operated. The results indicate mild increase in particle size with increasing pressure. There is no intention to purposely form a liquid aerosol in the high pressure environment, but there is always a possibility that the accidential juxtaposition of liquids and mechanical forces will produce liquid aerosols. It is thus necessary to have some base line techniques available for potential toxicological investigations. Author (GRA)

N71-22270*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EVALUATION OF SEVERAL TV DISPLAY SYSTEMS FOR VISUAL SIMULATION OF THE LANDING APPROACH
Wendell D. Chase Washington Mar. 1971 44 p refs
(NASA-TN-D-6274; A-3286) Avail: NTIS CSCL 05H

A study was conducted to determine the effect of several variations of two types of visual display systems on subjective pilot evaluations and objective measures of performance in the landing approach. Two types of flight approaches were made with either a projector or quasicollimated monitor visual display: (1) the instrument approach, and (2) the visual approach without the normal cockpit instrumentation assistance. The variables examined were color; differences between displays due to quasicollimation of the monitor display; and reduced resolution as related to brightness, contrast, and sharpness. The pilots were more critical of the black and white variation for either display, and favored more use of a color system. Advantages cited for a color system included greater pilot relaxation, decreased fatigue, better picture quality, and more realistic depth perception, particularly with the monitor display. With regard to the reduced-resolution monitor display, the pilots also noted a loss in depth perception and height references, increased visual fatigue, and increased efforts for a reasonable approach in comparison with the projector display. The objective performance measures of the study were reasonably consistent with the pilots' subjective evaluations and comments. Author

N71-22299# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EFFECTS OF SHORT-TERM LOW LEVEL CARBON MONOXIDE EXPOSURE ON HUMAN PERFORMANCE Final Report, Feb. – Aug. 1969
Robert D. O'Donnell, Peter Mikulka, Patrick Heinig, and James Theodore Jun. 1970 59 p refs
(AD-717716; AMRL-TR-70-37) Avail: NTIS CSCL 6/20

The effects of 0, 50, 125, 200, and 250 ppm of carbon monoxide exposure on human time estimation, tracking, ataxia, galvanic skin response and heart rate were tested in 10 subjects. Mean carboxyhemoglobin levels from .96 to 12.37% were reached after 3 hours of exposure. No significant symptoms were reported by subjects, and no ability to detect the presence of CO was noted. No overall trend toward poorer estimates of a 10 second interval occurred as a function of CO uptake, and tracking performance did not become worse over the course of the exposure to CO. There were some indications that subjects under CO showed a different overall pattern of tracking over time than control subjects in that their performance curve was flatter. However, this observation must be considered tentative. No changes in absolute heart rate occurred during task performance in any group, but there was slightly less cardiac deceleration at the onset of a task in the CO groups during early exposure. No differences in galvanic skin response were found between any groups. It is concluded that the present data do not support the hypothesis that low level carbon monoxide exposure results in human performance decrements. Additional investigation is required to define the lower limit and extent of such exposure to resolve major conflicts in the literature. Author (GRA)

N71-22301# Advisory Group for Aerospace Research and Development, Paris (France).
PHYSICAL FITNESS IN FLYING INCLUDING THE AGING AND AGED AIRCREW
H. W. Kirchhoff, ed. Mar. 1971 173 p refs Presented at the Specialist Meetings of the Aerospace Med. Panel of AGARD, Garmisch Partenkirchen, West Germany, 21 – 22 Sep. 1970
(AGARD-CP-81-71) Avail: NTIS

Physical fitness and pilot performance in connection with physiological training are considered. A variety of the symptoms of the aging process are described and their effects on the performance of flying personnel are considered.

N71-22302# Clemenshospital, Muenster (West Germany).
PHYSICAL FITNESS AND FLYING
Alfred Koch *In* AGARD Phys. Fitness in Flying including the Aging and Aged Aircrew Mar. 1971 16 p refs

Avail: NTIS

The term fitness is described and defined as a state which characterizes the degree to which the human organism is able to function. Measurements of physical fitness aptitude and of the factors that impair or improve fitness are discussed in relation to flying aircrews. G.G.

N71-22303# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
METHODS OF MEASURING PHYSICAL FITNESS
H. W. Kirchhoff *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 5 p

Avail: NTIS

Single stage, non-steady state, submaximal exercise procedures are commonly used in diagnostic and functional testing. The principal modes of imposing the workload are step climbing, bicycle ergometer riding and treadmill walking. These tests are generally available and safe. Despite many real and hypothetical deficiencies, they may yield, when standardized, qualitative and quantitative information of considerable value to individual clinical evaluations and to group comparisons. Steady state submaximal exercise tests determine a great number of values (V sub O2, V sub CO2, RQ, V sub E, specific ventilation, oxygen pulse, pulse rate, blood pressure and the ECG). Vita maxima tests are utilized to determine the maximum values of oxygen consumption and the physical working capacities. Author

N71-22304# Army Research Inst. of Environmental Medicine, Natick, Mass. Military Ergonomics Lab.
PHYSICAL FITNESS, FLIGHT REQUIREMENTS AND AGE
Ralph F. Goldman *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 9 p refs

Avail: NTIS

Muscular strength, cardio-respiratory capacity and relative body weight are frequently-used criteria of physical fitness. These different aspects of fitness all alter predictably with age and can be altered by training. Considering the physical work involved in flight, it seems appropriate to consider to what degree physical fitness -- and which aspects of it -- should be important to an aircrew. Excess weight may require premature replacement of an individual because of the decreased longevity associated with being overweight, but should not hinder flight performance as long as the man fits into his workspace, and agility and reach are unimpaired. The energy cost of flying only averages 125 kcal/hr and even an average 65 year old in fair condition has a maximum work capacity at least 3 times that. Finally, the muscular forces required to fly modern aircraft are minimized by electro-mechanical control systems. Author

N71-22305# Canadian Armed Forces Inst. of Environmental Medicine, Toronto (Ontario).
PHYSICAL FITNESS AS PART OF AIRCREW TRAINING
C. L. Allen *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 9 p
Avail: NTIS

Physical fitness development of aircrew candidates in the Canadian Forces is an integral part of their training. Schedules have been established and promulgated for all levels of training from newly enrolled cadets to the advanced flying school stages. While all of the standard elements of physical conditioning, such as calisthenics, resistance training and sports activities are included, the emphasis is on cardio-respiratory development. Regular assessments of candidates are carried out, using the 12-minute distance as the

vehicle for testing. All personnel are expected to maintain a good category, i.e. at least 1.50 miles in 12 minutes for ages under 30 years with a suitable reduction for older candidates. Author

N71-22306# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Institut fuer Flugmedizin.

PHYSICAL TRAINING STATUS IN RELATION TO STRESS TOLERANCES

H. M. Wegmann and K. E. Klein *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 11 p refs

Avail: NTIS

The Influence of physical fitness on stress tolerance was studied by comparing two different groups of subjects, one group including 11 highly trained athletes and the other group consisting of 11 untrained and unadapted students. Both groups were uniformly subjected to hypoxia, acceleration, exercise, and orthostatic stress, applying maximal loads for evaluating tolerances and submaximal loads for studying cardiovascular and hormonal stress responses. In summarizing the results the following conclusions were obtained: A better physical fitness does not imply higher tolerances to stressors other than exercise. There is no indication which supports the idea of an improvement of human tolerance to environmental extremes by physical exercise training. Author

N71-22307# German Air Force, Porz-Wahn (West Germany).

PHYSICAL CONDITIONING TRAINING AND FITNESS TEST OF GERMAN AIR FORCE AIRCREWS

W. Hill *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 7 p ref

Avail: NTIS

Physical conditioning training and fitness tests for German Air Force flying crews are considered as an alternative to the United States of America's Aerobics Physical Fitness Program. The purpose of both programs is to improve the physical conditions of aircrew members until the levels of optimum fitness are attained and thereafter to maintain these high levels for as long as possible. There are, however, essential differences in the application of the two methods. Author

N71-22308# Army Personnel Research Establishment, Byfleet (England).

EXERCISE TOLERANCE OF MILITARY PERSONNEL

M. F. Haisman *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 6 p refs

Avail: NTIS

The exercise tolerance of British Army personnel has been investigated by means of estimates of maximal oxygen intake (Vo2 max.) and the Harvard step test. Vo2 max. was estimated from heart rates, recorded during performance of standardized exercises on stepping stools or bicycle ergometers. About 650 men have been included in the study. The results have indicated that estimated Vo2 max. provided an index of fitness suitable for application to large groups of men, in that it was reproducible, and sensitive in respect of separating groups of trained and untrained men and in detecting the improvements in fitness associated with intensive physical training. The Harvard step test results were of broadly similar pattern to the Vo2 max. results but reproducibility was poorer. Men with a high body fat content showed a marked tendency to have a low Vo2 max. Author

N71-22309# Strasbourg Univ. (France). Inst. Dentaire.

AERONAUTICAL FACTORS AND TOOTHACHE INCIDENCES DURING FLIGHT [FACTEURS AERONAUTIQUES ET INDIVIDUELS DES DOULEURS DENTAIRES EN VOL]

R. Frank, J. M. Debruge, and A. M. Pfister *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 8 p refs In FRENCH; ENGLISH summary Prepared jointly with Centre d'enseignement et de Rech. de Med. Aeron.

Avail: NTIS

A recent investigation made on 230 conventional and jet aircraft pilots in the French Air Force has provided a comprehensive picture of the incidence of toothache in flight and of its favoring factors. Over a year of observations, it was found that 6.52% of the investigated pilots suffered from toothaches in flight. Pains developed according to a rather characteristic process during the various phases of flight: (1) chronic pulpitis induces short lived, progressively appearing, throbbing type pains which appear mostly during climbs; (2) wisdom teeth, and periapical reactions on mortified teeth or improperly stopped radicular canals rather induce pains during descents; and (3) periapical granulomas become painful in cruise flights without any marked speed variations: the induction of such neuralgias is related, among other reasons, to the vibrations experienced by the pilot. Author

N71-22310# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

COMBINED ENVIRONMENTAL, EMOTIONAL, AND PHYSICAL ACTIVITY THERAPY: A MODERN PREVENTIVE AND RECONDITIONING PROGRAM

J. D. Meyer-Erkelenz *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 14 p refs

Avail: NTIS

Physical exercise training combined with environmental-emotional and Terrain-Kur effects is an optimal therapy in preventing and reconditioning treatment of civilization and hypokinetic diseases, because a predominantly neuro-vegetative alteration in the whole body takes place. The results on heart, respiration, muscles, vascular, metabolic, hormonal, CNS and other organic systems are detailed. The physical fitness of German Air Force pilots is maintained or increased by (1) exercise training designed for individual performance; and (2) the active cure-treatment with multiple additional therapeutic elements, e.g. sauna, hydrotherapy, skin brush massage, etc. The gymnastic exercises are described and illustrated. Positive success is demonstrated in measurable facts and stress tests before, during and after the 4 weeks of cure. Author

N71-22311# Canadian Armed Forces Inst. of Environmental Medicine, Toronto (Ontario).

AEROBIC CAPACITY SURVEY: CANADIAN FORCES PERSONNEL

C. L. Allen *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 4 p refs

Avail: NTIS

The maximum oxygen intake of a representative sample of 1004 Canadian Forces personnel has been determined. The daily activity patterns as well as heights, weights, skinfold thicknesses and smoking histories were also recorded. The values for aerobic power are similar to those reported for other N.American groups in the same age range. The levels of daily activities and smoking histories have measurable effects on the endurance fitness of these personnel. Author

N71-22312# Erlangen-Nuremberg Univ. (West Germany).

FUNDAMENTAL SUBJECTS OF GERONTOLOGY AND PARTICULARITIES OF GERIATRICS

R. Schubert *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 4 p

Avail: NTIS

The biological aspects of senescence are considered. For the purpose of performing systematic work in this field, it is necessary to differentiate and clearly define the various forms of

calendar based or chronological senescence. Besides this form of senescence governed by the unbiased time factor, there is also the most important form of biological senescence, including the two sub-forms of physiological and psychological aging. The psychological chronograph records the personal time of an individual, the decisive factor being the experiences the individual has lived through during that period. Physiological senescence is determined by the development, growing and aging of morphae and the functions of organs. The most rigorous criteria are imposed by calendar time, which sets absolutely unbiological upper and lower age limits. The problem of flexible age limits is once more becoming most important. Author

N71-22313# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

PHYSICAL ACTIVITY AND AGING

H. W. Kirchhoff *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 5 p

Avail: NTIS

There appears to be acceptable evidence that exercise does affect biochemical and physiological parameters related to ischemic heart disease and to the myocardium itself. It is remarkable that a physical fitness program of the German Institute of Aviation Medicine had an extraordinarily good effect on blood pressure, ECG and other parameters. Since this program was begun, increases in blood pressure have been considerably less frequent. There occurred a lowering of the heart rate at rest and during exercise, an improvement of orthostatic tolerance, normalisation of exercise induced hypoxic electrocardiographic changes at low oxygen pressure and an increase of oxygen uptake respiratory volume and oxygen pulse during physical effort. These data corroborate the concept of a preventive and rehabilitative value in physical and environmental-emotional conditioning programs. The training program provides objective evidence for a clearly favorable influence of conditioning periods on cardio-vascular function of the aging pilot. Author

N71-22314# Naval Aerospace Medical Inst., Pensacola, Fla. Naval Aerospace Medical Research Lab.

THE THOUSAND AVIATORS: A THIRTY YEAR FOLLOW-UP

R. E. Mitchell, A. Graybiel, A. Oberman (Ala. Univ.), and W. R. Harlan (Ala. Univ.) *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 5 p

Avail: NTIS

The thousand aviator project is a longitudinal study with the emphasis primarily on defining new physical standards for aviators and secondarily on an epidemiological study of aging. The present report is limited to a discussion of the electrocardiographic and blood pressure findings. Longitudinal changes in the resting electrocardiograms have shown that those individuals with a decrease in QRS amplitude and a leftward movement of the QRS vector appear to have a tendency to develop coronary artery disease. Some of the men in the group have shown a consistent rise in blood pressure, apparently related to weight gain and parental longevity. Otherwise there are no means by which the blood pressure pattern of an aging individual can be predicted. Author

N71-22315# Canadian Armed Forces Inst. of Environmental Medicine, Toronto (Ontario).

MORBIDITY OF AIRCREW IN THE CANADIAN FORCES IN RELATION TO AGE

W. J. C. Stevenson *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 8 p

Avail: NTIS

One of the factors in the consideration of the aging process in aircrews is the relationship of illness, injury, and physiological incidents. Evaluations of 268 pilots and air navigators, representing 6.8% of the established Canadian aircrew strength, were carried out because individuals either failed to meet prescribed medical standards or else had developed some difficult, obscure or border-line medical problems which raised a question of fitness to continue flying. Data indicate that diseases of the circulatory system were cause for removal from flying duties of the largest number of older aircrew members, while psychiatric disorders resulted in the greatest number of groundings in the younger group. Author

N71-22316# School of Aerospace Medicine, Brooks AFB, Tex.

THE EFFECTS OF AGING ON BODY COMPOSITION AND EXERCISE PERFORMANCE IN THE USAF AIRCREW POPULATION

John W. Ord and Malcolm C. Lancaster *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 10 p refs

Avail: NTIS

Nine hundred seventeen healthy aircrewmen ranging in age from 25 to 49 years were evaluated for minor medical findings. During the same period, 348 pilots were evaluated as part of the selection process for special projects such as space flight. The differences between the groups, and in subgroups according to age, in parameters bearing on physical fitness are described. The special project group was more fit than the other normal group, as demonstrated by their response to maximal treadmill testing, had a lesser body fat fraction and lower blood lipid and glucose levels. Older subgroups demonstrated lower maximal treadmill exercise performance, had higher body fat fractions and tended to demonstrate higher levels of blood lipids and glucose. Author

N71-22317# School of Aerospace Medicine, Brooks AFB, Tex.

A COMPARISON OF THE EFFECTS OF EARLY CARDIOVASCULAR DISEASE AND AGING UPON MAXIMAL EXERCISE PERFORMANCE IN THE USAF AIRCREW POPULATION

Malcolm C. Lancaster and John W. Ord *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 8 p refs

Avail: NTIS

The influence of early, mild cardiovascular disease upon maximal exercise performance in 544 flyers, ages 40-49 years was considered. There were 300 normal subjects, 64 subjects with non-specific repolarization changes on the electrocardiogram, 114 subjects with hypertension and 66 subjects with coronary heart diseases. The NSTWC and hypertensive groups had significantly higher body fats than normals. There were no significant differences between the disease groups and normals with respect to blood sugar and serum lipids. Both the hypertensive and CHD groups had significantly lower maximal oxygen consumptions and total treadmill times than normals. Systolic blood pressures in all disease groups were significantly higher at rest than in normals. Systolic blood pressure increased as expected in normals and a parallel increase was seen in the disease groups. Diastolic blood pressure was unchanged at maximal exercise in normals, while all disease groups were significantly higher. Blood pressure levels in the hypertensive group were significantly higher at rest than the other disease groups and remained proportionately higher with exercise. Author

N71-22318# Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).

TRACING OF ARTERIOSCLEROSIS DURING EVALUATION OF FLYING PERSONNEL [DEPISTAGE DE L'ATHEROSCLEROSE DANS L'EXPERTISE DU PERSONNEL NAVIGANT]

R. Carre, J. Salvagniac, and F. Plas *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 9 p refs In FRENCH

Avail: NTIS

Cardiovascular abnormalities in more than 3000 flying personnel were studied during a 12 year period by performing electrocardiographic, cholesterol content, and carotidogrammetric evaluations. It was established that more than 30% of the disabled group had cardiovascular diseases with the greatest number found between 45 to 50 years of age; aging personnel were more accident prone and pilots of the French Air Force were grounded if they showed typical arteriosclerotic symptoms. Also grounded were pilots over 40 years of age with ECK abnormalities. Transl. by G.G.

N71-22319# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
PSYCHOPHYSIOLOGICAL PROCESSES OF AGING
H. J. Grunhofer and K. Gerbert *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 7 p refs

Avail: NTIS

Facts observed so far concerning variations and decrement of cognitive, psychomotoric and retentive abilities with increasing age are reported. Generally it can be assumed that almost all psychophysical performance functions decrease as of the third decade of life. But abilities with increasing age are essentially dependent upon the level of original aptitude, type and extent of experience gained in the course of life, thinking patterns, and trained procedures consolidated through exercise. On the other hand, particular decreasing capabilities can only be compensated by others within certain limits. As a result, adjustment and readjustment to requirements which cannot be met by means of confirmed behavior became increasingly difficult. An analysis of presently used methods to measure flying proficiency in aging pilots is given. Author

N71-22320# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
HEARING ACUITY IN RELATION TO AGE AND FLYING TIME
G. R. Froehlich *In* AGARD Phys. Fitness in Flying Including the Aging and Aged Aircrew Mar. 1971 8 p

Avail: NTIS

The pure tone audiograms of 1024 Air Force pilots and 100 applicants were classified into 3 categories: (Q1) the 25% with best hearing capacity; (Q2) the 50% with medium hearing capacity; (Q3) the 25% with poorest hearing capacity; and S: hearing losses of industry population. The evaluation had the following results: (1) pilots classified as Q 1 and Q 2 had a hearing acuity that was slightly better or equal to comparative age groups of a normal industry population; (2) Even in the Q 3 groups with marked hearing losses, the main speech frequencies of 500 - 2000 Hz showed only negligible impairment; (3) the hearing acuity of jet-pilots is slightly better than that of pilots in helicopters and propeller aircraft; and (4) for the decrease in hearing acuity age is more important than flying time. Author

N71-22321# Centre de Medecine Aeronautique, Brussels (Belgium).
LONGITUDINAL STUDY OF SPIROMETER VALUES FOR NAVIGATOR PERSONNEL OF THE BELGIAN AIR FORCE [ETUDE LONGITUDINALE DES VALEURS SPIROMETRIQUES DU PERSONNEL NAVIGANT DE LA FORCE AERIENNE BELGE]
J. Bande *In* AGARD Phys. Fitness in Flying including the Aging and Aged Aircrew Mar. 1971 7 p
Avail: NTIS

Long term spirometric measurements on Belgian Air Force flying personnel, obtained over a period from 5 to 10 years, are evaluated in order to establish the influence of aging on physical fitness concurrent with the process of aging. A new special formula is presented that is applicable for ages 15 through 55 and can be used to predict the developing vital capacity for each individual subject during aging. Transl. by G.G.

N71-22341# Air Force Academy, Colo.
THE EFFECTS OF SOUND ON COLOR INTENSITY PERCEPTION
L. Ralph Chason and William P. Mockovak Dec. 1970 23 p refs
(AD-717715; USAFA-TR-70-6) Avail: NTIS CSCL 6/16

Sensory interaction occurs when the response elicited by a sense modality due to a specific stimulus is significantly affected by the simultaneous stimulation of that sensory system by any other sense modality in the body. This experiment is concerned with the interaction of audition and vision where the auditory conditions consist of no sound, pleasant sound, and unpleasant sound (as judged by the subject), and the visual conditions consist of equal intensity judgments on red, green and blue lights against a white standard. The data from thirty subjects are discussed including main effects and interaction of experimental conditions. The hypotheses concerning the differential sensitivity of the dark-adapted eye to red, green and blue colored lights are confirmed. The hypotheses concerning the influence of audition on vision are not confirmed. The potential influence of the reticular activating system is discussed in light of these findings. Author (GRA)

N71-22347# Missouri Univ., Columbia. Space Sciences Research Center.
EFFECTS OF HYPEROXIA ON COMPOSITION AND RATE OF SYNTHESIS OF FATTY ACIDS IN ESCHERICHIA COLI
Olen R. Brown, Harvey F. Howitt, Jack L. Stees, and Wesley S. Platner Jan. 1971 34 p refs
(Contract N00014-67-A-0287-0002)
(AD-717673; TR-1) Avail: NTIS CSCL 6/1

Growth and fatty acid synthesis in Escherichia coli were inhibited by oxygen at partial pressures above one atmosphere, and were prevented by exposure to oxygen at 4.2 atmospheres on membranes incubated on a minimal medium. Growth and fatty acid synthesis returned to control rates when cells were removed from hyperoxia to air. The spectrum of fatty acids produced was unchanged by oxygen at pressures which reduced the rate of synthesis. In situ fatty acids were stable to oxygen at pressures which prevented growth and synthesis. Reinitiation of synthesis following complete inhibition in hyperoxia occurred without production of aberrant fatty acids. Fatty acid synthetase specific activity was virtually unchanged, compared to air controls, in cells exposed either to 3.2 or to 15.2 atmospheres of oxygen. The spectrum of fatty acids synthesized by cell-free extracts during incubation in 4.2 atmospheres of oxygen was not different from air incubated controls. Synthetase assays included added NADPH, acyl carrier protein, mercaptoethanol and malonyl coenzyme A; hence, only damage, other than reversible sulfhydryl oxidation, to the apoenzymes of synthetase was ruled out. Author (GRA)

N71-22448# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Civil Engineering.
THE USE OF FOAM IN THE EMERGENCY SUPPORT OF HOVERCRAFT DURING POWER FAILURE AT SEA Final Report
Thomas E. Stelson Aug. 1970 33 p refs
(Contract Nonr-760(29))
(AD-717676) Avail: NTIS CSCL 6/7

The purpose of the study is to determine the effectiveness of high expansion liquid foams as a shock absorber and stabilizer when used in the plenum chambers of hovercraft at sea and under power failure conditions. The study was conducted in two phases. Phase One was concerned with the question of stabilization of and foam flow out from under a small simple model representing a

hovercraft. Briefly these tests showed that for selected values of bubble size and expansion factor, and thus viscosity, the escape of foam from the plenum chamber was at a much slower rate than the escape of air. Phase Two studies were conducted on a larger scale model to determine the response of a hovercraft to the action of waves, as if at sea, with high expansion foam filling the plenum chamber. Reduced accelerations using foam rather than air were not generally significant. The results are also difficult to extend to prototype behavior since modeling relationships for the foams are unknown. Author (GRA)

N71-22451# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N.Mex. Bio Effects Div.
DEPARTMENT OF TRANSPORTATION DAISY TRACK HUMAN TOLERANCE TEST Final Report
Charles D. Bendixen Jun. 1970 15 p
Avail: NTIS

An impact test program to compare and evaluate lap belt vs lap belt plus air cushion restraints was conducted. Tests included both human and baboon subjects. The human tests are described. The purpose of the entire study was to provide statistically significant comparisons of the effectiveness of various restraint systems, including air bag restraints during impact conditions. For the human portions covered by this report, a separate purpose was stated to compare man's subjective tolerance levels during impact using the following restraint systems: (1) lap belt; (2) lap belt plus air bag. The experimental approach as specified in the work statement called for subjecting five human subjects to increasingly severe impacts in each of the two restraint configurations being compared until in the subject's (subjective tolerance) or the medical monitor's opinion the testing of either of the two restraint configurations in question should be terminated. Testing with the other restraint was to be continued until a similar level was reached. Tolerance levels would then be compared. Author

N71-22452# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N.Mex.
DEPARTMENT OF TRANSPORTATION DAISY TRACK BABOON LETHAL TOLERANCE TESTS Final Report
Thomas D. Clarke Jun. 1970 179 p refs
Avail: NTIS

Comparative investigations were conducted to assess the biodynamic aspects and the protection from impact trauma provided by the lap belt, lap belt plus air bag and air bag only restraint systems. The objectives were to determine a lethal tolerance (LD sub 50) by exposure to abrupt linear deceleration (minus G sub x) and to define the patterns of injuries. Twenty-nine deceleration tests were performed with 19 adult male baboons weighting in excess of 45 lbs. Tolerance to impact (LD sub 50) was determined by sequential testing. Each baboon was impacted at a 3 g increment below or above the deceleration of the previous test, respectively depending upon whether there was or was not a fatality within three hours on the previous test. The primary advantage of this method was the concentration of testing near the tolerance level thus increasing the accuracy of LD sub 50 estimation. The LD sub 50 was that level where impact fatalities were expected in 50% of the animals. Author

N71-22506*# Techtran Corp., Glen Burnie, Md.
VARIATION IN THE PHOSPHOLIPID CONTENT OF E COLI CELLS DURING THEIR CHANGE INTO SPHEROPLASTS [MODIFICATION DE LA CONSTITUTION EN PHOSPHOLIPIDES DES CELLULES D'E COLI PENDANT LEUR TRANSFORMATION EN SPHEROPLASTES]
M.-C. Simmler et al Washington NASA Feb. 1971 15 p refs Transl. into ENGLISH from Ann. Inst. Pasteur (Paris), v. 119, 1970 p 289–301
(Contract NASw-2037)
(NASA-TT-F-13488) Avail: NTIS CSCL 06A

Cells of E. Coli cultivated in the presence of penicillin and saccharose change into spheroplasts, during which the phospholipid content is modified. There is a gradual increase in the proportion of lysophosphatidylethanolamine (LPE) and diphosphatidylglycerol (DPG) and a decrease in the proportion of phosphatidylethanolamine (PE) and phosphatidylglycerol (PG). The phospholipases responsible for the formation of LPF from PE show increased activity with a fall in the osmotic pressure of the medium. The proportion of LPE increases even in the presence of low concentrations of penicillin. When the spheroplasts undergo a mechanical treatment, centrifugation and resuspension, there is a definite increase in LPE. The proportion of LPE increases each time that the cells suffer attack: a raised quantity of LPE is the sign of initiation of irreversible processes. On the other hand, the increase of DPG is reversible under certain conditions, which is significant as a defense mechanism because DPG (by the nature of its structure) can strengthen the membrane. The quantity of DPG varies in an opposite way to the other cell-synthesized products, which indicates that it plays a regulating role. Author

N71-22513*# AiResearch Mfg. Co., Los Angeles, Calif.
PRELIMINARY DESIGN AND DEVELOPMENT OF THE INTERMEDIATE WATER RECOVERY SYSTEM, VOLUME 1 Combined Final Reports, Sep. 1969 – Dec. 1970
J. Rousseau, ed. 12 Mar. 1971 560 p Revised
(Contracts NAS9-8460; NAS9-9981)
(NASA-CR-114960; Rept-70-7018-Vol-1-Rev-1) Avail: NTIS CSCL 06B

The water recovery system comprises a number of functions concerned with the collection, processing, and storage of urine, wash water, and humidity condensate produced by a 3-man crew on board an earth orbital spacecraft. Mission duration is one year with a 90-day resupply period. The two processing units are identical and are designed to process water at the same nominal rate of 1 lb/hr. The product potable water can be stored or transferred to the spacecraft water supply. Interconnecting lines permit water transfer from one unit to the other and also provide backup capability in emergency. All waste products from the processing units are stored in the form of a concentrated brine for return to earth at the 90-day resupply period. Author

N71-22514*# AiResearch Mfg. Co., Los Angeles, Calif.
PRELIMINARY DESIGN AND DEVELOPMENT OF THE INTERMEDIATE WATER RECOVERY SYSTEM, VOLUME 2 Combined Final Report, Sep. 1969 – Dec. 1970
J. Rousseau, ed. 12 Mar. 1971 280 p Revised
(Contracts NAS9-8460; NAS9-9981)
(NASA-CR-114961; Rept-70-7018-Vol-2-Rev-1) Avail: NTIS CSCL 06B

Preliminary component specifications and performance prediction computer program description for the water recovery system are presented. Author

N71-22557*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
CYANATE ION AND THE UREMIC SYNDROME
J. D. Ingham *In its* JPL Quarterly Tech. Rev., Vol. 1, No. 1 Apr. 1971 p 45–48 refs
Copyright. Avail: NTIS HC$6.00/MF$0.95 CSCL 06P

A critical survey is made of the literature that logically provides an hypothesis that relates the symptoms of kidney failure (uremic syndrome) to the presence of cyanate ion derived from metabolic urea. If the hypothesis can be unequivocally verified, the consequences will provide a solution to the problem of defining the primary toxic factor in uremia and should lead to substantial improvements in the available treatment for patients with kidney failure. Author

N71-22571*# Stanford Research Inst., Menlo Park, Calif.
TACTILE PERCEPTION STUDIES RELATED TO TELEOPERATOR SYSTEMS
J. C. Bliss, J. W. Hill, and B. M. Wilber Washington NASA Apr. 1971 79 p refs
(Contract NAS2-5409)
(NASA-CR-1775) Avail: NTIS CSCL 05E

The results of several experiments are reported dealing with tactile information processes, the use of tactile feedback in the performance of remote manipulations (teleoperator) tasks, and the development of a new software system designed for on-line experiment control by a small computer. Results of experiments designed to measure the short-term memory characteristics of visual and tactile perception suggest that short-term memory resides in an area common to both visual and tactile modalities. Results of remote manipulations studies with bilateral manipulators indicate that tactile feedback provides improved performance particularly for remote control situations where visual feedback is either poor or absent. Recommendations for improving system performance are provided. Author

N71-22664*# Systems Technology, Inc., Hawthorne, Calif.
EXPERIMENTAL VALIDATION AND ANALYTICAL ELABORATION FOR MODELS OF THE PILOT'S NEUROMUSCULAR SUBSYSTEM IN TRACKING TASKS
R. E. Magdaleno and D. T. McRuer Washington NASA Apr. 1971 93 p refs
(Contract NAS2-4828)
(NASA-CR-1757) Avail: NTIS CSCL 05E

The purpose of the experiments was to obtain direct describing function data for the muscle/manipulator actuation element, G sub m, portion of the whole human, Y sub p, in tracking situations. Both these describing functions were measured in a single-loop compensatory situation where the pilot used either a rudder pedal or a hand manipulator and controlled a first-order subcritical task for a variety of instability values. In addition second- and third-order subcritical tasks (hand manipulator only) were run to investigate neuromuscular system effects when the pilot must generate low-frequency lead. G sub m for rudder pedals and hand manipulator was quite similar in form and close in bandwidth. A spinal level closed-loop neuromuscular system was obtained which gives an excellent fit to the data if the alpha command signal is the command input to the neuromuscular system. The feedback path assumptions imply that muscle spindles are the dominant element for stiff spring restraints although the Golgi tendon organs fulfill a similar role. In addition the joint angle sensors may modify the pilot's dynamics for free-moving manipulators. For the hand manipulator, G sub m was basically unchanged for first-, second-, and third-order subcritical tasks; where the pilot must generate none, first-, and second-order low-frequency lead respectively, indicating that this lead is generated centrally rather than involving the peripheral neuromuscular system. Author

N71-22668 Purdue Univ., Lafayette, Ind.
EFFECTS OF HETEROGENEOUS TARGET BACKGROUNDS ON PHOTOGRAMMETRIC COORDINATE MEASUREMENTS
Robert Ellis Roger (Ph.D. Thesis) 1969 223 p
Avail: Univ. Microfilms: HC $10.15/Microfilm $3.00 Order No. 70-8960

This investigation is concerned with the centering by the human visual system of a black circular measuring mark in sharp circular targets simulating artificially marked points in a photographic emulsion. The results confirm that the visual system is remarkably sensitive to tasks of this type, pointing standard deviations of the order of 0.5 seconds of arc having been obtained. The targets were viewed against an infinite density surround with complete white annular rings serving as heterogeneous symmetric background configurations. Segments of these rings were used to simulate nonsymmetric configurations. The results indicate that for tasks of this type where the target and measuring mark are well-defined, there is no significant difference between monocular and binocular viewing, except for comfort with binocular viewing being preferred. The results also show that the precision of centering in the horizontal retinal meridian is significantly greater than in the vertical meridian. Dissert. Abstr.

N71-22679*# General Electric Co., Philadelphia, Pa.
ASTRONAUT ZERO GRAVITY PERFORMANCE EVALUATION PROGRAM: DETAILED TECHNICAL REPORT
D. G. Norman, G. Miller, M. C. Grohman, and R. W. Jones Washington NASA Mar. 1971 399 p refs
(Contract NAS9-8640)
(NASA-CR-1725) Avail: NTIS HC $6.00/MF $0.95 CSCL 05E

The Astronaut Zero Gravity Performance Evaluation Program was designed to fill a gap in our knowledge of man's capabilities to perform complex tasks in the zero-gravity environment. The resultant experimental program involved an evaluation of the major facets of astronaut performance while restricted to a limited work-site area. The program was performed during the period July 1968 through February 1970 and encompassed: (1) the definition and preliminary design of Experiment M508, an experiment concerned with astronaut worksite performance evaluation; (2) the fabrication of prototype hardware and collection of simulated astronaut worksite performance data using various ground based zero-gravity simulation modes; (3) the collection of additional data on man's force emission capability to establish 1-g and zero-g baselines; and (4) the preparation and publication of a handbook of human engineering design data for reduced gravity conditions. Author

N71-22748* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
RESCUE LITTER FLOATATION ASSEMBLY Patent
Richard A. Pollard and Glenn A. Shewmake, inventors (to NASA) Issued 26 Sep. 1967 (Filed 24 Aug. 1965) 8 p Cl. 9-312
(NASA-Case-XMS-04170; US-Patent-3,343,189; US-Patent-Appl-SN-482311) Avail: US Patent Office CSCL 06B

A rescue device consisting of a Stokes-type litter which has flotation equipment at the head end and an inflatable tube at the foot end is described. When used for water rescue operations, the litter floats vertically with the head end up. The person to be rescued is fastened to the litter while in the vertical position. The inflatable tube at the foot end is then inflated to cause the litter to assume a horizontal position which permits easier lifting of the person from the water. P.N.F.

N71-22896* National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Tex.
DIGITAL CARDIOTACHOMETER SYSTEM Patent
Virden M. Mitchell, inventor (to NASA) Issued 21 May 1968 (Filed 1 Oct. 1965) 5 p Cl. 128-2.06
(NASA-Case-XMS-02399; US-Patent-3,384,075; US-Patent-Appl-SN-492344) Avail: US Patent Office CSCL 06B

A system is devised for measuring the heartbeat rate over a predetermined portion of a minute. A pulse representative of a heartbeat is used to reset a counting circuit, each time the counting circuit is reset pulses are fed to a memory network. The number of counts stored on the memory network are fed into a readout circuit where the heartbeat rate in beats per minute is displayed. Thus, if the heartbeat is pressured over a fifteen second interval, four pulses will be fed to the memory for each heartbeat pulse signal, and if the heartbeat is measured over a ten second interval, six pulses will be fed to the timing circuit for each heartbeat pulse signal. A diagram of the proposed system is included. Official Gazette of the U.S. Patent Office

N71-22976*# Texas Univ., Dallas. Southwestern Medical School.
TEMPERATURE DISCRIMINATION, BEHAVIORAL THERMOREGULATION AND RELATED MEASURES IN THE RAT Final Report

James P. Lipton [1971] 9 p
(Grant NGR-44-012-079)
(NASA-CR-117851) Avail: NTIS CSCL 06C

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3. EFFECTS OF HIGH FAT DIETS ON CALORIC INTAKE, BODY WEIGHT, AND HEAT ESCAPE RESPONSES IN NORMAL AND HYPERPHAGIC RATS J. M. Lipton 9 p refs

4. DETERMINANTS OF BEHAVIORAL THERMOREGULATION AGAINST HEAT: THERMAL INTENSITY AND SKIN TEMPERATURE LEVELS J. M. Lipton, D. D. Avery, and D. R. Marotto 6 p refs (See N71-22980 11-04)

N71-22977*# Texas Univ., Dallas. Div. of Psychology.
HYPERTHERMIA INDUCED BY DIRECT INJECTIONS OF CARBACHOL IN THE ANTERIOR HYPOTHALAMUS
D. D. Avery *In its* Temp. Discrimination, Behavioral Thermoregulation and Related Meas. in the Rat 1971 4 p refs

Avail: NTIS CSCL 06P

Microinjections of carbachol in the anterior preoptic hypothalamic area in rats was found to induce hyperthermia. The magnitude of the injection effects was dose dependent, and the results were associated with intraventricular injections of acetylcholine. Author

N71-22978*# Texas Univ., Dallas. Southwestern Medical School.
EFFECTS OF DESALIVATION ON BEHAVIORAL THERMOREGULATION AGAINST HEAT
James M. Lipton and Daniel R. Marotto *In its* Temp. Discrimination, Behavioral Thermoregulation and Related Meas. in the Rat 1971 5 p refs Repr. from Physiol. Behavior (England), v. 4, 1969 p 723-727
Avail: NTIS CSCL 06P

Male and female rats made subtotally desalivate by section of the major saliva ducts were tested in operant thermoregulation sessions. This surgery, which impairs a major thermoregulatory response in the rat, produced a rise in operant behavior to reduce heat exposure among the male animals. Through this increased responding, the reduction in evaporative heat loss following desalivation was compensated somewhat, allowing postsession temperatures to be maintained at the normal presurgery levels. Female desalivates did not show an increase in responding. Another effect beneficial in coping with heat stress, the lowering of presession body temperature, emerged among both experimental and control animals in the post operative sessions. The earlier finding of stable post session body temperatures (38.0-39.0 C) in normal animals when this variable is under behavioral control was also noted in the animals of this experiment. Author

N71-22979*# Texas Univ., Dallas. Southwestern Medical School.
EFFECTS OF HIGH FAT DIETS ON CALORIC INTAKE, BODY WEIGHT, AND HEAT ESCAPE RESPONSES IN NORMAL AND HYPERPHAGIC RATS
James M. Lipton *In its* Temp. Discrimination, Behavioral Thermoregulation and Related Meas. in the Rat 1971 9 p refs Repr. from J. Comp. Physiol. Psychol., v. 68, no. 4 p 507-515

(Contract NIH 5-S01-FR-5426-05)
Avail: NTIS CSCL 06P

Animals made hyperphagic through hypothalamic lesions showed characteristic changes in body weight and alterations in heat-escape response which were related to increases and decreases in the body weight measures. The increased response in both normal and hyperphagic rats is interpreted to be behavioral compensation for restricted body heat loss resulting from increments in depot fat insulation. Author

N71-22980*# Texas Univ., Dallas. Medical School.
DETERMINANTS OF BEHAVIORAL THERMOREGULATION AGAINST HEAT THERMAL INTENSITY AND SKIN TEMPERATURE LEVELS
James M. Lipton, D. D. Avery, and D. R. Marotto *In its* Temp. Discrimination, Behavioral Thermoregulation and Related Meas. in the Rat 1971 6 p refs Repr. from Physiol. Behavior (England), v. 5, 1970 p 1083-1088
Avail: NTIS CSCL 06P

To elucidate the factors controlling thermoregulatory behavior, two experiments were conducted using rats trained to escape heat by holding down a lever. In both experiments, the time spent responding was found to increase in a monotonic fashion as thermal intensity was increased. Determination of the behavioral response was explored by recording dorsal skin temperature at the moment when a response was begun and when it was terminated. In a neutral environment (23 C), a relatively stable level of skin temperature was maintained in the face of intensity alterations as a result of the changes in behavior. A qualitatively similar result was also seen when the animals were tested in a hot environment (32 C). These findings are consistent with the results of previous heat reinforcement experiments which have indicated a peripheral basis for the control of thermoregulatory behavior. In the cold (5 C), raising intensity brought about a linear increase in response and in the skin temperature. Author

N71-23053 Advisory Group for Aerospace Research and Development, Paris (France).
PRINCIPLES AND PRACTICE OF BIONICS
H. E. von Gierke, W. D. Keidel, and H. L. Oestreicher, eds. Oct. 1970 481 p refs Presented at the Bionics Symp., Belgium, 18-20 Sep. 1968
(AGARD-CP-44) Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

Bionic principles, techniques, and processes are applied to the study of living and life-like systems that find application in man-made technology. The support which biology and medicine lend to engineering processes is emphasized.

N71-23054 Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
BIONICS AND BIOENGINEERING IN AEROSPACE RESEARCH
Henning E. von Gierke *In* AGARD Principles and Pract. of Bionics 1968 p 21-41 refs
Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

The life sciences, physical sciences, mathematical sciences and engineering have developed important interdisciplinary areas of common interest and cross fertilization. These areas, characterized according to their goal by terms such as bionics, cybernetics, biophysics and bioengineering, have particularly been fostered in connection with such rapidly developing technologies as required by the challenges of advances in aerospace flight. These interdisciplinary areas are outlined and their present and future goals and some of the practical results, potential pay-offs and promises are discussed. Author

N71-23055 Stanford Univ., Calif. Dept. of Electrical Engineering.
ON MODELLING THE NERVOUS SYSTEM
M. A. Arbib *In* AGARD Principles and Pract. of Bionics 1968 p 43–57 refs
(Grant AF-AFOSR-1198-67)
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An overview of the functions of a cybernetic brain is given and the notion of neuroheuristic programming is introduced. Discussed are various modes of distributed information processing pertinent to modeling neuropsychological experiments. Various motives for modelling the nervous system and a consideration of their implications are given. Author

N71-23056 Institut Marey, Paris (France).
PRINCIPLES OF INFORMATION PROCESSING IN LIVING SYSTEMS [PRINCIPES DU TRAITEMENT DE L'INFORMATION PAR LES SYSTEMES VIVANTS]
A. E. Fessard *In* AGARD Principles and Pract. of Bionics 1968 p 59–72 refs In FRENCH; ENGLISH summary

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The general principles governing information processing in living systems are the same as those operating in man made machines, invented for practical purposes; but more than in any artificial machine, in living organisms these informational systems work at different organization levels, from organic molecules to individuals as a whole, passing through cellular and systemic levels; and there is constant interplay between these different levels. Different combinations of symbols play an effective role in executing specific programs: programming of enzyme action, processes of ontogenesis directed by the genetic code; immunological reactions, programming of motor behavior controlled by the central nervous system, programming of mental evocations, verbal expressions of an emotional or cognitive content. Reliable transmission of messages is only part of the function of biological systems and the best model of information processing in biology is most often that of pattern recognition. Author

N71-23057 Edinburgh Univ. (Scotland). Dept. of Machine Intelligence and Perception.
INFORMATION PROCESSING IN BIOLOGICAL AND ARTIFICIAL BRAINS
R. L. Gregory *In* AGARD Principles and Pract. of Bionics 1968 p 73 80 ref
Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

It is argued that behavior is not (except in primitive reflexes) controlled directly by sensory information, but rather that sensory information is used to select from the repertoire of stored models which themselves control behavior, though the available information is transitory and, for direct control, inadequate. The models allow prediction of the immediate future, which is vital for planned behavior and reduces reaction or computing time to zero. The classical visual distortion illusions are discussed in these terms - it is supposed that the perceptual models are scaled to fit the distances and sizes of surrounding objects by sensory information in real time - the scaling being inappropriate in atypical situations when the normal assumptions do not hold that the systematic distortions are generated. Distortion and other perceptual phenomena are used to infer the structure of the internal models and assumptions which are expected to allow but little information to control elaborate behavior. Author

N71-23059*# California Univ., Los Angeles. Space Biology Lab.
LEARNING FROM THE BIOLOGICAL VIEWPOINT
W. P. Adey *In* AGARD Principles and Pract. of Bionics 1968 p 99–118 refs
(Contracts NsG-237-62; NsG-502, NsG-505; NsG-1970; AF 49(638)-1387 et al)
(NASA-CR-117806) Copyright. Avail: NTIS; Technivision, Braywick House, Maidenhead, Berks, Engl. US Distribution: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido) CSCL 06D

Neurophysiological studies have indicated adaptive patterns in central nervous tissue, that relate in finely correlated ways with past experiences in cerebral systems. There is a hierarchy of observations from EEG records in performing man to cellular and subcellular phenomena that constitute substrates of gross processes, such as the EEG. These findings have suggested structural and functional schemes in cerebral tissue that relate to its unique capacity in storage, as opposed to transaction, of information; and to memory as a plastic tissue change, in contrast to the mere fixation of experience. Author

N71-23060*# Adaptronics, Inc., McLean, Va.
ADAPTIVE FLIGHT CONTROL SYSTEMS
Roger L. Barron *In* AGARD Principles and Pract. of Bionics 1968 p 119 167 refs Sponsored by NASA, AF and Navy

(NASA-CR-117807) Copyright. Avail: NTIS; Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido) CSCL 06D

The bionics approach is contributing to development of a new generation of adaptive flight controls. These controls organize themselves in their problem environment by use of a guided parameter space search. It has been found that the probability state variable (PSV) search algorithm is well suited for flight control, particularly for coupled, multi-variable systems. The PSV algorithm has its expression in multiple correlation logic units which identify time varying functional relationships between the plant excitation and response vectors. Continuous on-line performance assessment processes are used to guide the search. The performance assessment criterion can embody conflicting requirements imposed by the need for error minimization along with conservation of control resources. Controller networks consisting of performance assessment modules, correlation logic modules, and summing devices provide a path between each error input and each actuator excitation signal. Self-organizing systems achieve simultaneous control of plant multiple response variables. Results of several applications studies are described to demonstrate validity and potential of the approach. Author

N71-23063 Edinburgh Univ. (Scotland). MRC Speech and Communication Research Unit.
CEREBRAL MECHANISMS OF SPEECH
R. C. Oldfield *In* AGARD Principles and Pract. of Bionics 1968 p 197–207 refs
Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

There is a difference between the form of speech and its linguistic content. Damage to the cortical centers usually produces damage at the linguistic level - meaning semantics and syntactics; whereas damage to other parts of the nervous system tends to produce disturbances in the form of speech - loudness, intonation, stress, timing, speed and phonemic formation. This generalization is not watertight however, as, for instance, patients with lesions in the neighborhood of Broca's area show disturbed articulation, rhythm and phonemic distortion. It is postulated that the cerebral speech apparatus may be divided into two parts: the cortical centers which are similar to a set of interconnected computers,

storing, analyzing and collating, encoding and decoding and making up sentences, and the centers of basal ganglia, whose functions include regulation of tone, loudness, stress and rhythm of speech. In addition to the many internal connections the speech mechanisms include a feedback connection to the ear. Because of its accessibility, it has been the basis of several experiments. These have shown that an extra delay of 1/4 second introduced in the loop will profoundly affect articulation and continuity of speech in many people. Author

N71-23064 Ecole Pratique des Hautes Etudes, Paris (France). Directeur de Laboratoire d'Electronique.

PROCESSING AND RECOGNITION OF SPEECH [TRAITEMENT ET RECONNAISSANCE DE LA PAROLE]

L. Pimonow *In* AGARD Principles and Pract. of Bionics 1968 p 209-229 refs In FRENCH; ENGLISH summary

The discussion is first centered on the pattern and information recognition theory, and the sum of information involved in the classification of sound giving objects is evidenced. Then, based on the assumption that the organ of hearing represents a perfect system of acoustical information processing, a parallel and comparative analysis of the mechanism of hearing and of the various technical systems is made. In particular, attention is drawn to the number of data caught by the ear and especially the number of differential frequency, amplitude and duration levels, and to the progressive reduction of these data which is performed in the course of information processing by the ear. The time variation of the information rate imposed by the physiological properties of the ear is also discussed, as well as the relation between this rate variation and intelligibility. Then the differences between sound recognition and word recognition are stressed, together with the determining importance of transitory phenomena. Author

N71-23065 Laboratoire de Physiologie Acoustique, Jouy-en-Josas (France).

REVIEW OF THEMES PERTAINING TO BIOLOGICAL AND BIONIC ECHOLOCATION [THEMES DE REFLEXIONS A PROPOS DE L'ECHOLOCATION BIOLOGIQUE ET DE LA BIONIQUE]

R. G. Busnel *In* AGARD Principles and Pract. of Bionics 1968 p 231-237 refs In FRENCH; ENGLISH summary

Echolocation is pre-eminently one of the best themes of cooperation between biologists and engineers; it is typically bionic. It is shown by means of a few examples taken out of discussions on bats' and dolphins' sonars, that there are some points of agreement and some divergences, sometimes deep, between adherents of both disciplines. Author

N71-23066 Syracuse Univ., N.Y. Lab. of Sensory Communication.

VIBROTACTILE INFORMATION TRANSFER

Jozef J. Zwislocki *In* AGARD Principles and Pract. of Bionics 1968 p 239-259 refs Sponsored in part by Natl. Inst. of Neurological Diseases and Blindness

The skin covering human and animal bodies is endowed with several sensory systems which provide information about the environment in the immediate vicinity of the body. Some of the receptors respond to mechanical deformations of the body surface. Because the mechano-receptive systems appear to be relatively fast, attempts have been made to use them in artificial communication systems. A discussion of similarities and differences between the auditory and tactile characteristics is presented. The point of view is taken that if a set of transformations could be found such that the pertinent auditory characteristics could be mapped onto tactile characteristics, tactile speech communication in real time and with an extensive vocabulary becomes possible. It is pointed out that two tactile systems with strikingly different characteristics respond to vibration. Conditions under which one or the other system is activated are discussed. Author

N71-23067 Sheffield Univ., (England). Dept. of Psychology.

COMPUTER SIMULATION OF SOME VISUAL FUNCTIONS

Neville Moray *In* AGARD Principles and Pract. of Bionics 1968 p 261-274 refs

Simulations of lateral inhibitory networks were carried out, keeping as closely as possible to the values of the biological constants known from physiological work. The aim was to see whether such networks will produce figural aftereffects. Aftereffects were found, but the model was not quantitatively successful. A discussion of such networks shows that they provide a rapid dark and light adaptation mechanism, a brightness range compressor and an image enhancer. Author

N71-23068 University Coll., London (England). Dept. of Electrical Engineering.

NEURONAL MODELS OF PATTERN RECOGNITION, LEARNING AND SIZE INVARIANCE MECHANISMS IN THE BRAIN

W. K. Taylor *In* AGARD Principles and Pract. of Bionics 1968 p 275-291 refs

The integration of mathematically defined model neurons and synapses into functional learning networks is described. The networks form a complete functional system representing retina, visual cortex, association areas and mid-brain feedback paths. Properties of a synthesized model include learning to read alphanumeric characters, handwritten words, and the recognition of complex random patterns and human faces. Size invariance is also a feature of the model and it is shown that the postulated mathematical transformations lead to generalizations between size and distance whereby an object seen only at one distance in the past is recognized without further learning at any new distance. Furthermore, the new distances are predicted without clues from accommodation or binocular fusion. It is shown that the transformations can produce visual illusion signals when the receptive field contains conflicting information. Author

N71-23070 IIT Research Inst., Chicago, Ill. Odor Sciences and Olfactronics Center.

OLFACTORY INFORMATION PROCESSING AND MECHANISMS

Andrew Dravnieks *In* AGARD Principles and Pract. of Bionics 1968 p 309-340 refs

Vapors from various sources contain information about a source's nature and state. Living organisms interpret these chemical signals by means of receptor systems that can be either highly specialized and sensitive, as in some insects, or be able to interpret many complex chemical signals. Much signal processing occurs at the receptor level. The systems discriminate signals in terms of a limited

number of dimensions, less than ten, having complex physicochemical correlates. The receptor mechanism involves intermolecular interactions of odorant molecules with the receptor membranes and probably utilizes sensor or discriminatory substances. Coding at the higher neural level utilizes stimulation, no effect or inhibition. A review of physicochemical analytical processes indicates that olfactory analogs based on low resolution processes utilizing intermolecular interactions and the internal chemical logic of the source in principle can match human olfaction in sensitivity, speed and information content, and exceed it in accuracy. Author

N71-23071 Technische Univ., Berlin (West Germany).
BIOTECHNIQUE OF OSCILLATING PROPULSION SYSTEMS AND THEIR INTEGRATION INTO THE BODY
H. Hertel *In* AGARD Principles and Pract. of Bionics 1968 p 341 - 369
Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

An experimental investigation on biological oscillating propulsion systems has been carried out using fishes and water-channel models. Biomechanical considerations led to five new solutions, which have undergone investigation as models: (1) plate propeller for ship propulsion in shallow water and for towing; (2) plate propeller for pumping sludge; (3) engine arrangement behind fuselage for making use of the energy accumulated in the boundary layer (external integration); (4) development of low-drag fuselage-shapes; and (5) underfloor installation of propulsion units in the fuselage of VTOL aircraft. Author

N71-23072 Glasgow Univ. (Scotland). Dept. of Electrical Engineering.
METHOD FOR THE ANALYSIS OF THE NEURAL MECHANISMS FOR POSTURAL ADJUSTMENTS
T.D.M Roberts and D. J. Murray-Smith *In* AGARD Principles and Pract. of Bionics 1968 p 371 407 refs

Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

The laws of signal transformation by which the central nervous system constructs patterns of motor command from streams of sensory impulses are discussed. The pattern of motor commands to a limb extensor muscle in the cat in reflex response to rhythmic stretch is matched by computer simulation using a technique of parameter sensitivity testing. The response alters during head tilting and the parameters of the model are adjusted to maintain the match. The required laws of signal transformation are those that predict the nature of the necessary parameter changes from the time course of the labyrinthine signal reporting the head tilt. Author

N71-23073*# Massachusetts Inst. of Tech., Cambridge.
FUNCTIONS OF THE VESTIBULAR SYSTEM IN HUMAN GUIDANCE AND CONTROL
L. R. Young *In* AGARD Principles and Pract. of Bionics 1968 p 389 - 407 refs
Grants NSG-577; NGL-22-009-156; Contract AF 33(615)-5038) (NASA-CR-117808) Copyright. Avail: NTIS; Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido) CSCL 06P

A physical analog model of the vestibular system was developed that consists of a three gimbal head containing three rate gyroscopes and six linear accelerometers, and a special purpose analog computer simulating the dynamics and nonlinearities of the non-auditory labyrinth. The vestibular package can be rotated through normal head movements by the machine and mounted on a centrifuge or flown to measure actual motion inputs. The distance between the ears is adjustable, as well as the orientation of the sensitive direction of each canal and otolith axis. The computer console permits adjustment of the important gains, nonlinearities and time constants of the vestibular system for utility in refining models, training physiologists, predicting orientation perception or nystagmus and for aids in design of moving base simulators or artificial gravity platforms. Author

N71-23074 Michigan Univ., Ann Arbor.
MECHANISMS OF BIOLOGICAL MEMORY
R. J. von Baumgarten *In* AGARD Principles and Pract. of Bionics 1968 p 411 - 423 refs
Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

The evolution of biological memory as a process of adaption to the environment proceeded in gradual stages. The neurophysiological mechanisms of learning and memory are not known yet. The connectivity hypothesis of memory assumes that synaptic connections between neurons could change their efficacy, allowing new functional connections to be made. This hypothesis is challenged by the possibility of extra synaptic storage sites. Experiments with Aplysia neurons show that they can recognize, store and reproduce time intervals between stimulations. Conditioning at the cellular level would take place by the capability of special nerve cells to re-excite themselves after a subthreshold stimulus is given, but only if this stimulus was paired during a training period with a stronger threshold-reaching stimulus. The latency of this reself-excitation corresponds roughly to the interstimulus interval. Author

N71-23076 Wildfowl Trust, Slimbridge (England).
ASPECTS OF BIRD NAVIGATION
G. V. T. Matthews *In* AGARD Principles and Pract. of Bionics 1968 p 447 455 refs
Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

The nature and extent of migratory and homing flights and the conditions in which birds are able to navigate are described. Time compensated compass orientation is shown with reference to the sun and moon. The alignment of constellations is also used to obtain directional information. Bi-coordinate navigation is based on the discrimination of sensory stimuli. These do not appear to be based on the Earth's magnetic field or rotational effects, but on interpretation of the sun's position and movement along its arc. The sensory requirements and the degree to which they are met in the bird's physiology are discussed. Author

N71-23078 Illinois Univ., Urbana.
BIONICS: CRITIQUE AND OUTLOOK
H. von Foerster *In* AGARD Principles and Pract. of Bionics 1968 p 467 473 refs
(Contracts AF 33(615)-3890; AF-AFOSR-7-68; Grant OEC-1-7-071213-4557)
Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

A critical assessment of bionics and its interdiciplines is given. The central problem of information processing is the reduction and compression of information bionically by statistical analysis. G.G.

N71-23079 Free Univ. of Brussels (Belgium). Solvay Inst. of Physiology.
THE SIMULATION OF THE HEART'S ELECTRICAL GENERATOR SYSTEM, APPENDIX 1
P. Rijlant *In* AGARD Principles and Pract. of Bionics 1968 p 475 - 484

Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks, Engl. US Distributor: Circa Publications Inc., 415 Fifth Ave., Pelham, New York 10803 (Attn. Mr. A. L. Candido)

The quantitative appraisal of the electrical activity of the human heart is reported. One of the more promising approaches has been the simulation of the electrical generator system of the heart by dipolar or multidipolar generators, these generators being continuously controlled by the actual generator system in the heart. The fundamental principle involved is the continuous comparison of the heart's and the artificial generator systems, the difference signals being continuously utilized to modify and control the artificial generator. The only satisfying equilibrium condition of the system is the near identity of the natural and the artificial generators. Author

N71-23080* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GAS PURGED DRY BOX GLOVE Patent

Gustav Reinhardt, Max Quatinetz, and Thomas P. Herbell, inventors (to NASA) Issued 22 Aug. 1967 (Filed 12 Jan. 1965) 4 p Cl. 312-1

(NASA-Case-XLE-02531; US-Patent-3,337,279; US-Patent-Appl-SN-425096) Avail: US Patent Office CSCL 06Q

A gas purged dry box glove is described which is particularly adapted for use in dry box operation involving material sensitive to air or moisture such as submicron metal powders, also poisonous and radioactive materials. The dry glove box comprises an inner glove and an outer glove. The inner glove is adapted to sealingly engage the wrist of the wearer. The space between the inner and outer gloves is maintained at a pressure slightly higher than atmospheric by an inert gas admitted near the hand enclosing portion and exhausted near the hand receiving end. The inner and outer gloves are sealed and joined at the hand receiving end. Thus, the permeation of air or moisture into a dry box or isolator is reduced by diffusion of moisture through the gloves. E.M.C.

N71-23096* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

SOFT FRAME ADJUSTABLE EYEGLASSES Patent

Robert O. McBrayer, inventor (to NASA) Issued 23 Apr. 1968 (Filed 6 Jul. 1966) 3 p Cl. 2-14

(NASA-Case-XMS-06064; US-Patent-3,378,851; US-Patent-Appl-SN-563646) Avail: US Patent Office CSCL 06B

A pliable frame for sunglasses is described suitable for folding and packaging in emergency survival kits. The frames are constructed from a laminate of nylon and Velcro. The glasses are held in place by two elastic bands which extend from the sides of the sunglass frame around the wearer's head and are secured by Velcro tabs. Official Gazette of the U.S. Patent Office

N71-23159* Macon-Rust Co., Lexington, Ky.

STRETCHER Patent

Francis X. Lothschuetz, inventor (to NASA) Issued 26 Sep. 1967 (Filed 18 Apr. 1966) 5 p Cl. 5-82 Sponsored by NASA

(NASA-Case-XMF-06589; US-Patent-3,343,180; US-Patent-Appl-SN-543206) Avail: US Patent Office CSCL 06B

A stretcher is described with a relatively rigid head support for giving lateral, fore-and-back, and longitudinal support to the head and neck of the patient. The stretcher also provides for support of the immobilized body of a person in a vertical position, whereby the stretcher and the person on it may be hoisted vertically through a vehicle hatch to the exterior. The principal parts of the head support can be made separable along parting lines between identical halves for incorporation in a splint stretcher. Drawings of the device are included with specifications. E.M.C.

N71-23160*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

DYNAMIC RECONSTRUCTION ERRORS IN DIGITAL TO ANALOG SYSTEMS WITH BIOMEDICAL APPLICATIONS

William P. Dotson, Jr. Washington Apr. 1971 42 p ref

(NASA-TN-D-6296; MSC-S-254) Avail: NTIS CSCL 06D

Various digital to analog conversion techniques are analyzed in order to determine the instantaneous error performance. The analytical technique is curve fitting of polynomials of zero to third order to the given digital sample points. Experimental results are also given on digitized electrocardiogram data processed through a third order polynomial, curve fitting routine. It is demonstrated that a trade off of system complexity (order of the polynomial) and transmission bandwidth is possible, with no decrease in the quality of the reconstructed data. Author

N71-23161* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HARD SPACE SUIT Patent

Hubert C. Vykukal, inventor (to NASA) Issued 15 Oct. 1968 (Filed 19 Jul. 1966) 13 p Cl. 2-2.1

(NASA-Case-XAC-07043; US-Patent-3,405,406; US-Patent-Appl-SN-566397) Avail: US Patent Office CSCL 06Q

A space suit is designed using a nonflexible material which has very low leakage when pressurized to the desired internal pressure, and in which the mobility of the suit is not a function of the internal pressure. This hard material is impervious to gas, and the bearings which provide the articulation are sealed in a manner which results in substantially less leakage than with a fabric suit. The suit also provides protection against thermal extremes, physical punctures, or radiation. Life support fluids pass through the covering portions, and it is possible to use multi-gas mixture in the life support system. The low resistance, high mobility articulation is provided by means of special arrangements of rotary bearings and flexible bellows. This rigid material space suit is useable over extended periods of time with substantially no deterioration. Drawings and specifications of the suit are included. E.M.C.

N71-23182*# Bionetics Corp., Hampton, Va.

ANALYSES AND SENSITIVITY STUDIES RELATED TO POSTLAUNCH RECONTAMINATION OF SPACE CRAFT AND THE PROBABILITY OF CONTAMINATION OF A PLANET Final Report

30 Dec. 1970 67 p refs Prepared for JPL

(Contracts NAS7-100; JPL-953009)

(NASA-CR-117883; Rept-71-2-5) Avail: NTIS CSCL 06A

Analyses of the probability of post-launch recontamination of spacecraft and the subsequent probability of planetary contamination were performed for flyby, orbiter, and lander capsule unmanned planetary missions. Sources of microbial contamination, pertinent mission events, and spacecraft design and operating characteristics were identified and analyzed. The recontamination of the spacecraft from the shroud during the launch phase was identified as a problem common to all types of missions. The additional factor of redistribution of organisms from the nonsterile portions of the spacecraft to the attached lander capsule prior to capsule deorbit was also studied. Studies were made of the sensitivity of the probability of planetary contamination to the various factors involved in recontamination for the three types of missions. Of the various factors, the probability of particle ejection from spacecraft surfaces was found to be of greatest significance for all missions. Author

N71-23185* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

METHOD AND APPARATUS FOR CONTINUOUSLY MONITORING BLOOD OXYGENATION, BLOOD PRESSURE, PULSE RATE AND THE PRESSURE PULSE CURVE UTILIZING AN EAR OXIMETER AS TRANSDUCER Patent

Joseph R. Smith, Jr., inventor (to NASA) Issued 26 Nov. 1968 (Filed 30 Aug. 1965) 5 p Cl. 128-2.05

(NASA-Case-XAC-05422; US-Patent-3,412,729;

US-Patent-Appl-SN-483885) Avail: US Patent Office CSCL 06P

An ear oximeter is used to provide arterial blood oxygen saturation. The output from the infrared photocell of the oximeter is also applied to a variable gain dc amplifier of the differential type which develops an output signal commensurate with blood pressure. The blood pressure signal is applied to a variable gain dc amplifier which blocks the dc component and suitably amplifies the ac component of the blood pressure signal to develop the pressure pulse signal. The inputs to the amplifiers and the gains of the amplifiers are adjusted so that the systolic and diastolic pressures can be obtained. Official Gazette of the U.S. Patent Office

N71-23214# Royal Aircraft Establishment, Farnborough (England). Human Factors Group.

HUMAN PILOT MODELLING

H. F. Huddleston *In* AGARD Freq. Response Functions and Human Pilot Modelling Mar. 1971 p 59 65 refs

Avail: NTIS

Human factors engineering attempts to define pilot transfer functions are considered. Input-output engineering studies show that man as a tracker: (1) behaves like a low-pass amplifier; (2) has a built in reaction time delay; (3) can, in some circumstances, generate substantial lead or lag characteristics; and (4) behaves as if he responded to some events about twice a second. Author

N71-23231# Martin Marietta Corp., Orlando, Fla.

TARGET AND TERRAIN CONTRAST EFFECTS ON AIR SEARCH AND RESCUE OBSERVER PERFORMANCE

Frank D. Fowler and Daniel B. Jones [1971] 16 p

Avail: NTIS

An experimental evaluation of the environmental and human factors which affect the ability to detect and recognize targets on the ground during search and rescue operations was conducted. The primary objectives of the evaluation were: (1) to determine the effect of target-to-background contrast on the visual angle and slant range requirements for target detection and recognition, (2) to determine target detection threshold in both static and dynamic modes, and (3) to determine the target recognition threshold in both static and dynamic modes. Author

N71-23241# Joint Publications Research Service, Washington, D.C.

SPACE BIOLOGY AND MEDICINE TEXTBOOK

B. V. Parin et al 21 Apr. 1971 229 p refs Transl. into ENGLISH of the book 'Kosmicheskaya Biologiya i Meditsina' Moscow, Prosveshcheniye Press, 1970 p 1-224

(JPRS-52929) Avail: NTIS

The principal subjects within the field of space biology and medicine are discussed including the formulation of methods for selecting and training cosmonauts, medical measures for ensuring flight safety and maintaining normal vital functions, health and performance of cosmonauts during long spaceship flights in interplanetary space and when on planets of the solar system. Author

N71-23247# Stanford Research Inst., Menlo Park, Calif.

SURVEY OF ARTIFICIAL INTELLIGENCE Final Report

Peter E. Hart and Richard O. Duda Jan. 1971 9 p refs

(Contract N00014-68-C-0266)

(AD-718381) Avail: NTIS CSCL 6/4

The report gives a concise description of the topics covered in our surveys of two major aspects of artificial intelligence: problem solving and pattern recognition. The survey of problem solving gives separate treatment to three main approaches, the state-space, problem-reduction, and formal-logic approaches. The survey of pattern recognition covers statistical classification and scene analysis. These topics encompass major fields of research in artificial intelligence. Author (GRA)

N71-23281# Delaware Univ., Newark. Dept. of Psychology.

PSYCHOLOGICAL CORRELATES OF PHYSIOLOGICAL CIRCADIAN PERIODICITY Final Technical Report, 1 Mar. 1969 - 31 Aug. 1970

George T. Hauty and F. Loren Smith 1 Feb. 1971 26 p refs

(Contract N00014-69-C-0236)

(AD-717982) Avail: NTIS CSCL 6/16

Numerous psychological and physiological assessments were made on adult male, human subjects five times a day at four-hour intervals beginning at 0700 hours. Except for these periods of assessment (approx. 30 minutes duration) no other change was imposed upon their accustomed daily routine of activity nor upon their habits of sleep. Circadian periodicity was found to be clearly manifested by physiological functions; however, little or no corresponding periodicity was demonstrated by the psychological functions assessed. Author (GRA)

N71-23294# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ESTIMATES OF THE EXPECTED QUALITY OF SIGNS

M. M. Bongard et al 5 Nov. 1970 15 p refs Transl. into ENGLISH from Probl. Kibern. (Moscow), no. 20, 1968 p 151-157

(AD-717887; FTD-HT-23-475-70) Avail: NTIS CSCL 6/4

In constructing pattern recognition algorithms a certain number of characteristic features, which are selected during the learning process, are used. In selecting such features it is intended that the probability of the recognition error be minimized. Therefore, the problem of evaluating the quality of selected features arises, which is analyzed in this article. Two methods which make it possible to select the most informative features are presented. The first method is based on the selection of the class of features for a set of examples used in the learning process. It is shown that the probability of a recognition error using that feature (the quality of a feature) is a monotone function of given parameters. The second method based on the fact that during the learning process the approximate given distribution of the probabilistic characteristics of features can be constructed. The given distribution is the a priori distribution of the probabilities that the analyzed feature has a given measure and that the pattern having that feature belongs to a given class. This distribution is further used in determining the quality of selected features. GRA

N71-23317* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

BLOOD PRESSURE MEASURING SYSTEM FOR SEPARATING AND SEPARATELY RECORDING dc SIGNAL AND AN ac SIGNAL Patent

Howard A. Vick, inventor (to NASA) Issued 16 Sep. 1969 (Filed 27 Dec. 1966) 5 p Cl. 307-260; Int. Cl. H03k5/20

(NASA-Case-XMS-06061; US-Patent-3,467,837;

US-Patent-Appl-SN-605092) Avail: US Patent Office CSCL 06B

A system for separating and separately recording a dc blood pressure signal and an ac signal representative of Korotkoff sounds is described. To record both signals the reprogramming system of the device separates the two signals, and the Korotkoff sounds are recorded on one channel and the dc pressure signal is converted to a frequency modulated signal and recorded on another channel. Thus, the inherent frequency limitations of the recorder are avoided, and an accurate record of the blood pressure signal may be made. Official Gazette of the U.S. Patent Office

N71-23337# Advisory Group for Aerospace Research and Development, Paris (France).

PRINCIPLES OF BIODYNAMICS APPLICABLE TO MANNED AEROSPACE FLIGHT PROLONGED LINEAR AND RADIAL ACCELERATION

Mar. 1971 182 p refs

(AGARDograph-150; AGARD-AG-150-71) Avail: NTIS

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7. BIODYNAMICS BIBLIOGRAPHY, 1966-1969 W. L. Jones (NASA, Washington, D. C.) p 126-196 refs

N71-23339# Advisory Group for Aerospace Research and Development, Paris (France).

AN INTRODUCTION TO THE PHYSICS AND PHYSIOLOGY OF ACCELERATION

S. D. Leverett, Jr. *In its* Principles of Biodynamics Applicable to Manned Aerospace Flight Prolonged Linear and Radial Acceleration Mar. 1971 p 7 24

Avail: NTIS

The history of acceleration and its relation to aviation medicine is reviewed along with a brief discussion of the conventional terminology for discussing these forces and the physiological effects and clinical response of the human body to these forces. A.L.

N71-23341# Advisory Group for Aerospace Research and Development, Paris (France).

A SUMMARY OF HUMAN TOLERANCE TO PROLONGED ACCELERATION

A. S. Hyde and H. W. Raab *In its* Principles of Biodynamics Applicable to Manned Aerospace Flight Prolonged Linear and Radial Acceleration Mar. 1971 p 37-56 refs

Avail: NTIS

A summary of data from literature on human tolerance to prolonged acceleration is presented in tabular and graphical form. Standard terminology derived from an AGARD-NATO agreement on the equivalence of acceleration terminology was used. Most of the graphs present the magnitude acceleration on an arithmetic ordinate axis and the duration of the exposure on a logarithmic abscissa. Separate groups of graphs are included for each direction of acceleration. Each group of graphs is further divided on the basis of the presence, absence, or character of experimental variables, such as restraint and support system, aides, and the number of subjects involved. For each graphic summary of magnitude, direction, and duration, a stick-figure illustration of the subject's attitude is given and a table provided. Each table defines each point on each graph with respect to the following variables: vector magnitude, duration, average onset (G/second), back angle, cause of termination of experimental exposure, trauma, number of subjects involved, countermeasures used, support, restraint, and the reference from which this information was obtained. A.L.

N71-23344*# National Aeronautics and Space Administration, Washington, D.C.

BIODYNAMICS BIBLIOGRAPHY, 1966 - 1969

Walton L. Jones, comp. *In* AGARD Principles of Biodynamics Applicable to Manned Aerospace Flight Prolonged Linear and Radial Acceleration Mar. 1971 p 125-196 refs

(NASA-TM-X-67138) Avail: NTIS CSCL 06B

This annotated bibilography brings together recent information, not available in earlier literature reviews, concerning biodynamics research findings. Coverage was international and provides a representative view of current research efforts. The abstracts were taken directly from the initial source documents. The bibliography is divided into six sections: (1) prolonged acceleration (linear and radial); (2) angular acceleration; (3) impact; (4) vibration; (5) combined stresses; and (6) general documents. A.L.

N71-23352 Deep Submergence Systems Project Office, Chevy Chase, Md.

DECOMPRESSION SCHEDULE DEVELOPMENT FOR REPETITIVE SATURATION: EXCURSION HELIUM-OXYGEN DIVING

Robert C. Bornmann 1 Jun. 1970 98 p refs

(AD-718907; RR-1-70) Avail: NTIS CSCL 6/19

A twelve month program of saturation-excursion diving operations was carried out to test newly developed tables for repetitive, no-decompression excursions from helium-oxygen saturation exposures at depths between 150 feet and 600 feet. 1126 excursions were performed in accordance with the tables. The extensive test program not only validated these tables but provided as well a massive confirmation of the conservative adequacy of the extrapolated M values of Workman in this depth range. The format for saturation final decompression was also modified and improved during this program. Author (GRA)

N71-23355# School of Aerospace Medicine, Brooks AFB, Tex.

ON SITE AUDIOMETER CALIBRATION CHECK Progress Report, 1968 - 1969

Harrell C. Sutherland, Jr. and Donald C. Gasaway Nov. 1970 15 p refs

(AD-718417; SAM-TR-70-78) Avail: NTIS CSCL 6/5

Feasibility of on-site audiometer calibration checking with portable apparatus was explored. Three Medical Equipment Repair Centers checked audiometers in their geographic areas for six months. Conclusions were that (1) the on-site audiometer calibration checks were feasible, (2) the apparatus employed was suitable, and (3) the pass-fail criterion selected was satisfactory. General calibration status of audiometers observed seemed to improve during the course of the study. Author (GRA)

N71-23376*# Techtran Corp., Glen Burnie, Md.

WATER SUPPLY OF COSMONAUTS [VODOOBESPECHENIYE KOSMONAVTOV]

N. Radchenko Washington NASA Apr. 1971 8 p Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), Sep. 1970 p 31-32 (Contract NASw-2037)

(NASA-TT-F-13634) Avail: NTIS CSCL 06K

A brief review is given of the water regeneration problem in a spacecraft and progress made toward developing a closed ecological system with a self-contained biological cycle. Experimental research performed in the U.S.S.R., including a medico-technological experiment in which three volunteers were enclosed for one year in a capsule simulating a space cabin, depending solely on regeneration for water supply, is noted. Regenerative methods developed in the U.S. are also noted. Author

N71-23381# Naval Electronics Systems Command, Washington, D.C.

SANGUINE SYSTEM ENVIRONMENTAL COMPATIBILITY ASSURANCE PROGRAM (ECAP). PROJECT SANGUINE Status Report, 1967 - 1970

Richard E. Carlson Dec. 1970 370 p refs

(AD-718828) Avail: NTIS HC $6.00/MF $0.95 CSCL 6/6

The Project SANGUINE environmental compatibility assurance

program is described: its goals, work accomplished and results to date are presented. Part 1 is the program overview. The ECAP, the SANGUINE environment, the program status, and future research plans are outlined. Part 2 is a summary of major program areas. Biological and ecological assurance includes pertinent literature, *electrical safety, biological and biochemical research, ecological* surveys, heart pacer experiments and associated activities. Facilities construction and operation assurance addresses environmental awareness, land acquisition and joint use, installation, land restoration and coordination. Interference mitigation describes interference theories, systems and devices susceptible to extremely low frequency (ELF) interference, interference mitigation thresholds, techniques and practices. Part 3 is a description of the program management. Supporting technical documentation is provided in four appendices.
Author (GRA)

N71-23382*# Scripta Technica, Inc., Washington, D.C.
A CYTOCHEMICAL STUDY OF LACTIC DEHYDROGENASE ISOENZYMES IN SOME SPECIES OF THE PROTOZOA [TSITOKHIMICHESKOYE ISSLEDOVANIYE ISOFERMENTOV LAKTATDEGIDROGENAZY U NEKOTORYKH VIDOV PROSTEYSHIKH]
I. G. Berezina NASA Apr. 1971 9 p refs Transl. into ENGLISH from Tsitologiya (Moscow), v. 12, no. 9, 1970 p 1205 - 1208
(Contract NASw-2036)
(NASA-TT-F-13624) Avail: NTIS CSCL 06M

Lactic dehydrogenase isoenzymes were cytochemically detected in four species of free-living Protozoa: Amoeba proteus, Spirostomum ambiguum, Paramecium caudatum and Tetrahymena pyriformis. The LDH of A. proteus and S. ambiguum is sensitive to increased concentrations of Na lactate and to high temperature, whereas the LDH of P. caudatum and T. pyriformis is sensitive to the inhibiting effect of urea. It was concluded that LDH of the H type predominates in A. proteus and S. ambiguum, whereas P. caudatum and T. Pyriformis contain, in the main, LDH of the M type.
Author

N71-23388*# Translation Consultants, Ltd., Arlington, Va.
THE EFFECT OF DIURESIS ON THE ACTIVITY OF LACTIC DEHYDROGENASE AND LEUCINE AMINO PEPTIDASE [VLIV DIURESY NA AKTIVITU LAKTATDEHYDROGENASY A LEUCINAMINOPEPTIDASY V MOCI]
A Mojzis Washington NASA Apr. 1971 10 p refs Transl. into ENGLISH from Vnitrni Lekar. (Brno), v. 16, no. 8, 1970 p 739 - 744
(Contract NASw-2038)
(NASA-TT-F-13557) Avail: NTIS CSCL 06P

Increased diuresis results in increased activity of lactic dehydrogenase (LDH) and leucine amino peptidase (LAP) enzymes *in urine dispensed during a certain period of time, and in decreased* activity in 1 ml of urine. Reduced diuresis results in increased activity in 1 ml of urine and in reduced activity of the enzymes in urine dispensed during a certain period of time. There is, therefore, an indirect relationship between the enzymes in 1 ml of urine and the diuresis, but this relationship is not linear. There is a relatively constant activity of LDH in 1 ml of urine; in the case of LAP, however, there is an increased activity in a volume of urine dispensed during a certain period of time.
Author

N71-23393# Naval Aerospace Medical Inst., Pensacola, Fla. Research Lab.
STATE AND TRAIT ANXIETY IN STUDENT NAVAL AVIATORS
Steven F. Bucky, Charles D. Spielberger, and Ronald M. Bale 4 Dec. 1970 9 p refs
(AD-718326; NAMRL-1125; NAVMED-MF12.524.002-5001D) Avail: NTIS CSCL 5/10

Measures of state and trait anxiety were given to aviation officer candidates (AOCs) with the usual instructions as well as with instructions to answer as if each had just made his first landing on an aircraft carrier. Significant differences were sought when comparing the experimental group to college students.
Author (GRA)

N71-23394# Army Medical Research Lab., Fort Knox, Ky.
THE DANCING ARABESQUE: AN UNUSUAL VISUAL EFFECT Interim Report
Isaac Behar 30 Nov. 1970 9 p ref
(AD-718027; USAMRL-913) Avail: NTIS CSCL 6/16

An usual visual effect results from moving an achromatizing lens in front of the eye while viewing an intricate multicolored pattern. This consists of a relative change in the spatial position of areas of different color. An explanation of this effect is provided. Secondary visual effects are an illusion of depth, and the production of a border in the absence of one, or the exaggeration and minimization of borders when present.
Author (GRA)

N71-23399# Naval Aerospace Medical Inst., Pensacola, Fla. Research Lab.
A TECHNIQUE FOR OPTIMAL FITTING OF FLIGHT HELMETS
James W. Greene 30 Sep. 1970 13 p refs
(AD-718327; NAMRL-1118; NAVMED-MF12.524.005-7008B) Avail: NTIS CSCL 6/17

Although flight helmets selected for Navy use may possess exceptionally good noise attenuation qualities, *maximum attenuation* may not always be realized when the helmet is worn, particularly if the helmet does not fit. The lack of a standardized procedure for fitting flight helmets often results in a poor compromise that sacrifices noise exclusion for comfort. A procedure that involves the use of a noise source and an automatic recording audiometer has been developed as an aid in the fitting process. The noise source allows the aviator to detect acoustical leakage around his ears so that a better fit can be effected. Masked hearing threshold levels obtained with the helmets earphones may be used to demonstrate improved performance.
Author (GRA)

N71-23400# Stanford Research Inst., Menlo Park, Calif.
A SURVEY OF PATTERN CLASSIFICATION AND SCENE ANALYSIS
Richard O. Duda and Peter E. Hart Jan. 1971 89 p refs
(Contract N00014-68-C-0266)
(AD-718380) Avail: NTIS CSCL 6/4

Pattern recognition is an essential part of artificial intelligence, and has been the subject of extensive research. The report gives a survey of the literature on pattern recognition. The survey is divided into two main parts, the first part devoted to statistical pattern recognition, and the second part devoted to pictorial pattern recognition. With the partial exception of waveform recognition, almost all of the work in pattern recognition falls into one or the other of these two categories. The bibliography includes more than 500 references.
Author (GRA)

N71-23477# Texas Univ., Austin. Electronics Research Center.
BANDWIDTH REDUCTION OF SLEEP INFORMATION
J. A. Welch, Philip C. Richardson, Cecil W. Thomas, and Joanne M. Aldredge 10 Jul. 1970 179 p refs
(Contract F41609-69-C-0006; Grant AF-AFOSR-1792-69)
(AD-718125; TR-92; AFOSR-70-2202TR) Avail: NTIS CSCL 6/2

Many important space and military missions require maximal alertness which is dependent on adequate amounts of rest and sleep. In order to study sleep-wakefulness patterns in realistic space and military situations, it is necessary to monitor the level of arousal with simplified reliable band-limited devices. The limited time bandwidth available for the transmission of sleep information necessitates the development of a technique for data compression. This report describes the possibility of extracting sleep information

from heart rate data. Several features of heart rate which contain sleep information are computed and analysis of variance is used to indicate the suitability of these measures in the pattern recognition of sleep stages from heart rate data. Author (GRA)

N71-23478# Armed Forces Radiobiology Research Inst., Bethesda, Md.

ELECTROCARDIOGRAPHY IN A RADIATION ENVIRONMENT BY THE USE OF TELEMETRY

V. A. Kieffer and C. L. Turbyfill Oct. 1970 24 p refs

(AD-718315; AFRRI-TN70-6) Avail: NTIS CSCL 6/2

Electrocardiography using an implantable radiation hardened transmitter is described. This telemetry system allows an investigator to record the electrocardiogram (ECG) of unrestrained animals in a radiation environment. The transmitter and its use in an intense radiation field are described. The selection of electrode placement, surgical implantation of the transmitter, and the transmission and reception of a signal representative of the electrical activity of the heart from which an ECG recording is made are discussed. Author (GRA)

N71-23506# Ministry of Technology, Orpington (England). Reports Centre for Science and Technology.

SELECTIVE DISSEMINATION OF INFORMATION: A SYSTEM REVIEW

S. C. Schuler *In* AGARD Sci. and Tech. Inform. Feb. 1971 22 p refs

Copyright. Avail: NTIS

Selectivity is an essential factor in the transfer of information and the Selective Dissemination of Information (SDI) is a technique for providing individual users or groups of users with announcements of a limited number of documents specifically of interest to them. For large systems, selection of relevant documents is achieved by a computer program which compares a file of bibliographic data on current reports, journals articles, etc., with the interest profile of the SDI user. The selected references can be provided to the user in card form (useful for filing) or as a computer printed listing containing the main document bibliographic data, descriptor terms and, in some cases, a short abstract. A review was made of various automated systems which have developed in North America and Europe during recent years. Some experiences of both large and small SDI systems are discussed and detailed aspects such as profile construction, cost benefits and economics, and user surveys are considered. As an alternative to printed output an outline is given of a system using on-line access to a central information store enabling the user to have selected references displayed visually at his remote console. Author

N71-23586# Massachusetts Univ., Amherst. School of Engineering.

SOME DEEP SEA VEHICLE PERSONNEL HULLS AND ENERGY STORAGE SUBSYSTEMS. PROJECT THEMIS

William E. Heronemus and George R. Kidd Nov. 1970 95 p refs

(Contract N00014-68-A-0146)

(AD-717950; THEMIS-UM-70-7) Avail: NTIS CSCL 13/10

Personnel hulls capable of carrying one, two, or more operators to 20,000 foot depths are analyzed to measure operator comfort and utility index against weight, displacement, shape, dimensions and cost. Emphasis is placed on steel hull materials. Twenty-four different configurations of either lead-acid or silver-zinc energy storage batteries are analyzed. Competitive concepts for each of these major subsystems of the deep sea vehicle are compared against each other at the subsystem level. They are compared again after integration into complete deep sea vehicles. Author (GRA)

N71-23587# Texas Univ., Austin. Electronics Research Center.

REAL TIME MATCHED FILTER DETECTION OF THE QRS COMPLEX BY REPLICA CORRELATION

Carl A. Braun, F. X. Bostick, P. C. Richardson, J. A. Welch, and F. B. Vogt 26 Jun. 1970 62 p refs

(Grant AF-AFOSR-1792-69)

(AD-718124; TR-91; AFOSR-70-1726TR) Avail: NTIS CSCL 6/2

The report describes an approach to optimum detection of each cardiac cycle from noisy electrocardiograms. A filter matched to the QRS complex of the electrocardiogram is proposed to achieve the results. It is demonstrated analytically that such a filter yields the optimum signal to noise ratio obtainable in the presence of stationary Gaussian noise. While this type of filtering is done on a digital computer, and not in real time, the advent of medium and large scale integrated circuit technology has made it feasible to implement a specific piece of hardware for this purpose. Author (GRA)

N71-23616# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

SPEAKER-MACHINE INTERACTION IN AUTOMATIC SPEECH RECOGNITION

John I. Makhoul 15 Dec. 1970 121 p refs

(Contract DA-28-043-AMC-02536(E))

(AD-718255; TR-480) Avail: NTIS CSCL 17/2

The study examines the feasibility and limitations of speaker adaptation in improving the performance of a fixed (speaker-independent) automatic speech recognition system. A fixed vocabulary of 55 syllables is used in the recognition system, containing eleven stops and fricatives and five tense vowels. The results of the experiment on speaker adaptation, performed with 6 male and 6 female adult speakers, show that speakers can learn to change their articulations to improve recognition scores. The recognition scheme is based on the extraction of several acoustic features from the speech signal. This is accomplished by a hierarchy of decisions made on carefully selected parameters that are computed from a spectral description of the speech signal by means of a set of energoids (energy centroids), each energoid representing the center of energy concentration in a particular spectral energy band. Short-time spectra were obtained either from a bank of 36 bandpass filters covering the range 150-7025 Hz, or by directly computing the fast Fourier transform of portions of the sampled speech signal. Author (GRA)

N71-23728*# Translation Consultants, Ltd., Arlington, Va.

LACTIC DEHYDROGENASE OF URINE IN RENAL DISEASE. 1: LACTIC DEHYDROGENASE (LDH) IN GLOMERULONEPHRITIS AND NEPHROTIC SYNDROME [LAKTATDEHYDROGENASA V MOCI U LEDVINOVYCH CHORB. 1: LAKTATDEHYDROGENASA U GLOMERULONEFRITID A NEFROTICKYCH SYNDROMU]

A. Mojzis Washington NASA Apr. 1971 10 p refs Transl. into ENGLISH from Vnitrni Lekar. (Brno), v. 16, no. 9, 1970 p 862-867

(Contract NASw-2038)

(NASA-TT-F-13558) Avail: NTIS CSCL 06P

Statistically significant increases in the average of LDH activity in acute glomerulonephritic cases and in nephrotic syndrome cases were found, but none in chronic glomerulonephritis or in glomerulonephritis in reparation phase. A statistically significant positive correlation of LDH activity in the urine and activity level of the disease was found. LDH activity in the urine was positive and statistically significant in its relation to proteinurie and leukocyture in Addison sediment, but not to erythrocyturie or to the degree of renal inadequacy. In the case of acute glomerulonephritis, increased LDH activity in the urine may be a signal of the formation of a timely nephrotic syndrome, origin of subacute or chronic disease. In cases of chronic glomerulonephritis, increased LDH activity may be a symptom of the inception of a deteriorating process. Normal LDH activity in the urine, however, does not preclude the possibility of an advanced renal disease, since LDH activity in the urine does not depend on the degree of renal inadequacy. Author

N71-23749*# Scientific Translation Service, Santa Barbara, Calif.
CHEDIAK-HIGASHI DISEASE: SIMULTANEOUS PRESENCE OF TWO GENETIC ENTITIES [ENFERMEDAD DE CHEDIAK-HIGASHI. PRESENCIA SIMULTANEA DE DOS ENTIDADES GENETICAS]
F. D. Lascano et al Washington NASA Apr. 1971 20 p refs Transl. into ENGLISH from Rev. Clin. Espan. (Madrid), v. 110, 1 Aug. 1968 p 329-336
(Contract NASw-2035)
(NASA-TT-F-13537) Avail: NTIS CSCL 06E

A case of Chediak-Higashi disease is reported with a simultaneous case of Friedreich's hereditary spinal ataxia. The patient, deceased at the age of twenty-three, was the longest known surviving case of the genetic disease. The presence of target cells is discussed and the hematologic, neurologic, and genetic characteristics are described. Author

N71-23750# Martin Marietta Corp., Orlando, Fla.
TARGET ACQUISITION STUDIES: (1) TWO DIMENSIONAL COMPARED WITH THREE DIMENSIONAL TARGETS. (2) CHANGES IN GAMMA FOR TV DISPLAYED TARGETS Final Report, 1 Jan.-31 Dec. 1970
Frank D. Fowler, Melvin Freitag, Daniel B. Jones, and Barry King Jan. 1971 41 p refs
(Contract N00014-67-C-0340)
(AD-718382; OR-11091) Avail: NTIS CSCL 6/16

The study had two major objectives: the first was to determine whether the detection and recognition of 2 D targets are significantly different from the detection and recognition of 3D targets when target acquisition is performed using direct unaided vision and when utilizing a TV display. The second objective was to determine how differences in TV system transfer characteristics (gamma or dynamic gray scale) affect target detection and recognition capability. Trained pilots detected and recognized targets under simulated flight conditions utilizing both 2D and 3D targets with both the unaided eye and with the aid of a closed circuit TV system. Slant ranges and visual angle requirements were determined for the conditions tested. A second series of tests was run to determine the effect of changes in gamma (the gray scale transfer characteristic), on target detection and recognition capability with a TV sensor. Six trained pilots performed simulated targets detection and recognition tasks under three gamma levels. Slant ranges and visual angle requirements were determined for the conditions. Author (GRA)

N71-23751*# National Aeronautics and Space Administration, Washington, D.C.
HEART DISEASE DIAGNOSTIC TOOL
7 Apr. 1971 5 p
(NASA-News-Release-71-58) Avail: NASA Scientific and Technical Information Facility, P.O. Box 33, College Park, Md. 20740 CSCL 06B

The development of a computer animated display device is reported as a diagnostic tool for heart disease. A movie of a patients diseased heart beat permits the identification from any angle of dead spots or scar tissue in the heart wall, aneurysms, and other malfunctions. The display can be stopped at any point of heart action and played back and forth for many cycles. The displays are derived from X-ray movies, a computer program based on heart configurations and dimensions, and a three-dimensional computer display technique. J.M.

N71-23774 National Lending Library for Science and Technology, Boston Spa (England).
DEVELOPMENTAL RESEARCH ON DIRECTIONAL COGNITION OF TWO DIMENSIONAL SPACE: CONVERSION TO NUMERICAL FORMULAE OF DEVELOPMENT CURVES AND ANALYSIS OF ERRORS [NIJIGEN KUKAN NO HOKO NINCHI NI NANSURU HATTATSU-TEKI KENKYU: HATTATSU KYOKUSEN NO SUSHIKIKA TO AYAMARI NO BUNSEKI]
A. Katsui Mar. 1971 16 p refs Transl. into ENGLISH from Shinrigaku Kenkyu (Japan), v. 33, no. 2, 1962 p 63-69
(NLL-RTS-6354) Avail: Natl. Lending Library, Boston Spa, Engl.: £2.50; 5 NLL photocopy coupons CSCL 05E

The directional cognition in two-dimensional space of children from three to eight years old was investigated with a tachistoscopic board. Data curves show that the accuracy is about 50% for three-year olds, increases almost linearly for the four-, five-, and six-year olds, and gradually approaches to a little less than 100% for the seven- and eight-year olds. Several equations were tried to fit the curve, and the best fit was obtained by a cubic equation with three polynomials. The cognitive accuracy decreased for directions in the following order: upwards, downwards, leftwards, rightwards, upper rightwards oblique, upper leftwards oblique, lower rightwards oblique, and lower leftwards oblique. N.E.N.

N71-23823*# Sandia Corp., Albuquerque, N.Mex.
A PRECISELY CONTROLLED, LOW RANGE HUMIDITY SYSTEM
Daniel M. Garst and Kermit F. Lindell Nov. 1970 20 p refs
(NASA Order W-12853)
(NASA-CR-118024; SC-RR-70-775) Avail: NTIS CSCL 06F

Controlled humidity systems have been developed for studies relating the effect of relative humidity to the dry heat inactivation of microorganisms. An extension of this development in which very low relative humidity values were obtained by pressurizing the saturation portion of the system is described. Even lower values were attained by subsequently passing the air through a desiccant bed. Author

N71-23824*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACECRAFT COMPONENT SURVIVABILITY DURING ENTRY INTO THE JOVIAN ATMOSPHERE
Byron L. Swenson Washington Apr. 1971 17 p refs
(NASA-TM-X-2276; A-3853) Avail: NTIS CSCL 22A

In response to the concern of the scientific community regarding the possibility of an accidental biological contamination of the middle levels of the atmosphere of Jupiter by components or fragments of an unsterilized spacecraft, an analysis has been made of the survivability of such bodies upon entry along possible entry trajectories. Survivability boundaries are calculated in terms of the body size and the material specific heat capacity and are shown for various average body specific gravities and as a function of entry angle. Author

N71-23825*# Public Health Service, Phoenix, Ariz. Applied Microbiology and Planetary Quarantine Section
SERVICES PROVIDED IN SUPPORT OF THE PLANETARY QUARANTINE REQUIREMENTS OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Quarterly Report, Jan.-Mar. 1971
Martin S. Favero Apr. 1971 23 p refs
(NASA Order W-13062)
(NASA-CR-118017; QR-33) Avail: NTIS CSCL 06M

The problem of microbial contamination of spacecraft and techniques for reducing the amount of contamination are described. The nature of the microbes found on spacecraft components and methods of training personnel in effective removal procedures are discussed. Author

N71-23848*# General Electric Co., Philadelphia, Pa. Missile and Space Div.
STUDY OF APPLICATIONS OF BIO-SPACE TECHNOLOGY TO PATIENT MONITORING SYSTEMS Final Report
W. A. Buck 17 Feb. 1971 343 p refs
(Contract NASw-2073)
(NASA-CR-118030) Avail: NTIS HC $6.00/MF $0.95 CSCL 06B

A study of the application of space biology developments to systems for monitoring the condition of patients is presented. The primary objective was to apply space technology to cardiovascular and pulmonary patient monitoring to improve the availability, reliability, and utility of data for medical diagnosis. The study is concerned with defining the following (1) performance requirements, (2) systems configurations, and (3) systems specifications. Author

N71-23849*# General Electric Co., Philadelphia, Pa. Missile and Space Div.
STUDY OF APPLICATIONS OF BIOSPACE TECHNOLOGY TO PATIENT MONITORING SYSTEMS: PROGRAM PLANS AND BUDGETARY COST ESTIMATES Final Report Supplement
17 Feb. 1971 155 p refs
(Contract NASw-2073)
(NASA-CR-118035) Avail: NTIS CSCL 06B

The application of space biology techniques to the development of patient monitoring systems is discussed. Four basic physiological monitoring modules are considered for: (1) cardiac, (2) cardiovascular, (3) pulmonary, and (4) body chemistry systems. Each modular configuration includes computational capability which is provided by a mini computer. Remote displays at bedside and nurse's station provide capability for monitoring the patient's condition. Author

N71-23978*# National Aeronautics and Space Administration, Washington, D.C.
ON THE DIFFERENCE IN THE TEMPERATURE OF THERMOPHILIC BACTERIA IN THE SOIL AND IN ARTIFICIAL NUTRIENT MEDIA [UEBER DIE VERSCHIEDENHEIT DER TEMPERATURANSPRUECHE THERMOPHILER BAKTERIEN IN BODEN UND IN KUENSTLICHEN NAEHRSUBSTRATEN]
Alfred Koch et al May 1971 9 p refs Transl. into ENGLISH from Centralblatt Fuer Bakteriologie (German), Sect. 11, v. 31, 1911 p 433 436
(NASA-TT-F-13650) Avail: NTIS CSCL 06M

An explanation of the occurrence of thermophilic bacteria in soil near Gottingen is sought. It is found that thermophilic soil bacteria grow at lower temperatures in the soil than in nutrient agar. Author

N71-24019*# Scientific Translation Service, Santa Barbara, Calif.
ANALYSIS OF CIRCADIAN RHYTHM IN BODY TEMPERATURE BY THE COSINOR METHOD [COSINOR-HO NI YORU TAION NO CIRCADIAN RHYTHM NO KAISEKI]
Ryohei Yurugi Washington NASA Apr. 1971 13 p refs Transl. into ENGLISH from Japan Air Self Defense Force, Aeromed. Lab. Rept. (Japan), v. 10, no. 4, 1970 p 181 187
(Contract NASw-2035)
(NASA-TT-F-13630) Avail: NTIS CSCL 06P

Application of Cosinor method to analysis of circadian rhythm in body temperature was examined. For this, oral temperatures of the healthy male and female subjects were measured fourteen successive times a day for seven days in the summer season, as well as the periodic cosine function, vectors of its amplitude and phase difference. The results are: (1) the Cosinor method may not be used to analyse the variation of body temperature in a narrow time band during a day. (2) the Cosinor method may be used to represent the general characteristics of circadian rhythm in body temperature by its amplitude and phase difference as a group, and (3) slight sexual differences were noted in circadian rhythm in oral temperature. Author

N71-24020*# Scientific Translation Service, Santa Barbara, Calif.
ANTIBACTERIAL BEHAVIOR OF LEUKOCYTES IN NORMAL SUBJECTS FOR CHEDIAK-HIGASHI DISEASE AND PELEGER-HUET'S ANOMALY [COMPORTAMIENTO ANTIBACTERIANO DE LOS LEUCOCITOS EN SUJETOS NORMALES, EN LA ENFERMEDAD DE CHEDIAK-HIGASHI V EN LA ANOMALIA DE PELGER-HUET]
Mario Salazar Mallen et al Washington NASA Apr. 1971 13 p refs Transl. into ENGLISH from Rev. Invest. Salud Publica, v. 30, no. 1, Jan.–Mar. 1970 p 5–16
(Contract NASw-2035)
(NASA-TT-F-13637) Avail: NTIS CSCL 06E

A comparison is made of the behavior of lymphocytes in being transformed into blasts under the influence of phytohemagglutinin and phagocytes as regards its effects on multiplication of S. aureus and S. marcescens in 6 healthy individuals, one with Pelger-Huet's anomaly and another with Chediak-Higashi's disease. The blast transformation and the nucleolar index were normal in the case of Pelger-Huet's anomaly and abnormal in Chediak-Higashi's disease. This suggested a behavior similar to that found in chronic lymphoid leukemia. While Pelger-Huet's anomaly showed a tendency toward staphylococcal destruction from the first through the third hours and Serratia continued to multiply, in Chediak-Higashi's disease, the former barely appeared before the third hour. However, Serratia proliferated abundantly initially, falling off in the end. Author

N71-24138*# Welson (B.) and Co., Inc., Hartford, Conn.
SUIT GLOVE ADVANCED THERMAL PROTECTION PROGRAM Final Report
1 Apr. 1971 43 p
(Contract NAS9-11231)
(NASA-CR-114974; BW-250) Avail: NTIS CSCL 06Q

Thermal conditioning techniques that allow for increased mobility, thermal performance, and greater tactility of extravehicular gloves are studied. An evaluation of all feasible techniques for active and passive heat transfer from the glove indicated two possible approaches consisting of a wire braid/tygon tubing technique and a metal bladder/tygon tubing concept for the active cooling provisions. The overglove designs included a lobster shell approach as well as the standard metal cloth design. These thermal protective assemblies were designed and fabricated for testing. The results of those tests and the conclusion are presented. Author

N71-24147* Royal Aircraft Establishment, Farnborough (England).
GARMENTS FOR CONTROLLING THE TEMPERATURE OF THE BODY Patent
Derek Rodney Burton, Bertie William Judd, and Leslie Collier, inventors (to NASA) Issued 4 Feb. 1969 (Filed 26 Oct. 1966) 3 p Great Britain Cl. priority 45709/65; Cl. 165-46; Int. Cl. F28f7/00; Int. Cl. A61f7/00; Int. Cl. F25d3/08 Sponsored by NASA
(NASA-Case-XMS-10269; US-Patent-3,425,486; US-Patent-Appl-SN-590158) Avail: US Patent Office CSCL 06Q

A garment for controlling the temperature of the human body by cooling or heating the skin is reported; it uses a network of flexible pipes for carrying a circulating liquid in a heat exchanging relationship with the body. Locating means in the form of fabric tunnels are provided which freely locate the pipes such that they can slidably move within the locating means and which restrain each pipe throughout its length in a circuitous serpentine configuration out of direct contact with the body for comfort. The pipe circuit as a whole can deform as a result of bending or twisting of the pipes with minimum restriction to deformation and stretching of the garment. Official Gazette of the U.S. Patent Office

N71-24173*# Minnesota Univ., Minneapolis. College of Medical Sciences.
DEVELOPMENT AND EVALUATION OF AN IMPEDANCE CARDIOGRAPHIC SYSTEM TO MEASURE CARDIAC OUTPUT AND OTHER CARDIAC PARAMETERS Final Progress Report 1 Jul. 1969 – 31 Dec. 1970

W. G. Kubicek, D. A. Witsoe, R. P. Patterson, and A. H. L. From
31 Dec. 1970 86 p refs
(Contract NAS9-4500)
(NASA-CR-114988) Avail: NTIS CSCL 06B

Engineering developments and resultant practical applications of the impedance cardiograph in obtaining information about the cardiovascular system are reported. The apparatus monitors cardiac output by thoracic electrical impedance and peripheral arterial flow as function of fluid volume change. G.G.

N71-24174*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 86)
Feb. 1971 141 p refs
(NASA-SP-7011(86)) Avail: NTIS CSCL 06D

This supplement to Aerospace Medicine and Biology (NASA SP-7011) lists 453 reports, articles, and other documents announced during January 1971 in Scientific and Technical Aerospace Reports (STAR) or in International Aerospace Abstracts (IAA). The first issue of the bibliography was published in July 1964; since that time, irregular supplements have been issued. Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. Author

N71-24256*# Battelle Memorial Inst., Columbus, Ohio.
***CLOSED SABATIER OXYGEN-RECLAMATION SYSTEM* Final Report, 1 Mar. - 31 Dec. 1969**
Byung C. Kim and John E. Clifford Jul. 1970 106 p refs
(NASA Order L-21229; Contract F33615-69-C-1455)
(NASA-CR-118025; AD-714062; AMRL-TR-70-8) Avail: NTIS CSCL 06K

A Closed Sabatier System for oxygen recovery from carbon dioxide was designed. Design analysis was based on a three man engineering prototype that consists of the following principal subsystems: a water vapor electrolysis/Sabatier unit, an electrochemical hydrogen stripper/Sabatier unit, a continuous catalytic methane decomposition unit, and a water vapor transfer unit. The electrochemical cell designs utilize Pd-25Ag hydrogen diffusion electrodes in tubular form containing Sabatier catalyst for integrated system operation. All components are designed for gravity independent operation with a minimum of critical rotating parts. The electrochemical units operate at about 200 C, and the methane decomposition unit at 850 C. System weight is about 90 kg with a power requirement of less than 1 kw for designed operation with 99 percent recovery of the oxygen value in the carbon dioxide feed. Author

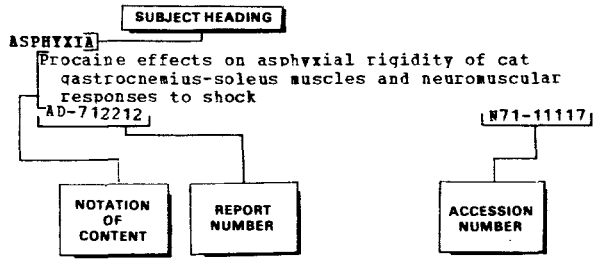
N71-24257*# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
THE MEASUREMENT OF RADIATION EXPOSURE OF ASTRONAUTS BY RADIOCHEMICAL TECHNIQUES Quarterly Research Report, 6 Jul. - 4 Oct. 1970
R. L. Brodzinski 15 Oct. 1970 13 p refs Sponsored by NASA
(NASA-CR-118027; BNWL-1183-6) Avail: NTIS CSCL 06R

The elemental concentrations of the fecal samples from the Apollo 12 and 13 missions are being determined by neutron activation and gamma ray analysis of the induced radionuclides. Packets of the capton used as the outer thermal coating of spacecraft were proton irradiated at 108, 375, and 600 MeV. The Be-7 and Na-22 excitation functions from this material are reported. The cross sections of these induced radionuclides are compared to the previously measured activities in the skin from the Apollo 8 and 12 mission spacecraft. The concentration of Po-210 in a piece of the outer thermal coating of the Apollo 12 spacecraft was determined. The origin of the Po-210 is assumed to be the escaping decay products from the uranium in the moon. The average lunar surface uranium concentration of 0.061 ppm determined in this manner appears to be too low by a factor of approximately 6 or 7 based on measurements of moon rocks and fines returned by the Apollo 11 and 12 missions. The construction of a semi-portable, multipurpose gamma ray spectrometer system is proposed. Suggested applications and a description of the high-efficiency, low background whole body counter and sample counter combination are given. Author

Subject Index

AEROSPACE MEDICINE AND BIOLOGY / *A Continuing Bibliography (Suppl. 91)* JULY 1971

Typical Subject Index Listing



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Stretcher with rigid head and neck support with capability of supporting immobilized person in vertical position for removal from vehicle hatch to exterior also useful as splint stretcher
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Blood plasma volume decrease, red cell mass and survival measurements in aquanauts of Tektite I at prolonged habitation
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Accelerated growth of Escherichia coli in high pressure helium-oxygen atmospheres
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Human lens fluorescent pigment O-beta-D- glucoside of L-3-hydroxykynurenine, discussing preparation, electrophoresis and paper chromatograms
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Human rods dark adaptation, investigating rhodopsin resynthesis and bright light flash effects
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Book on color and pattern vision physiology covering retinal induction, electrical excitation of eye, optical illusion, figural aftereffect, movement sensation, etc
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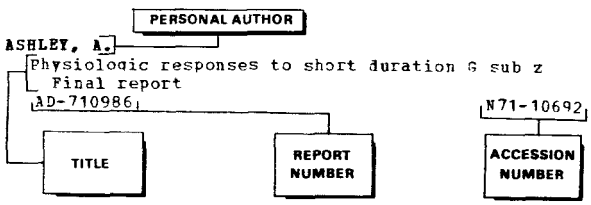

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